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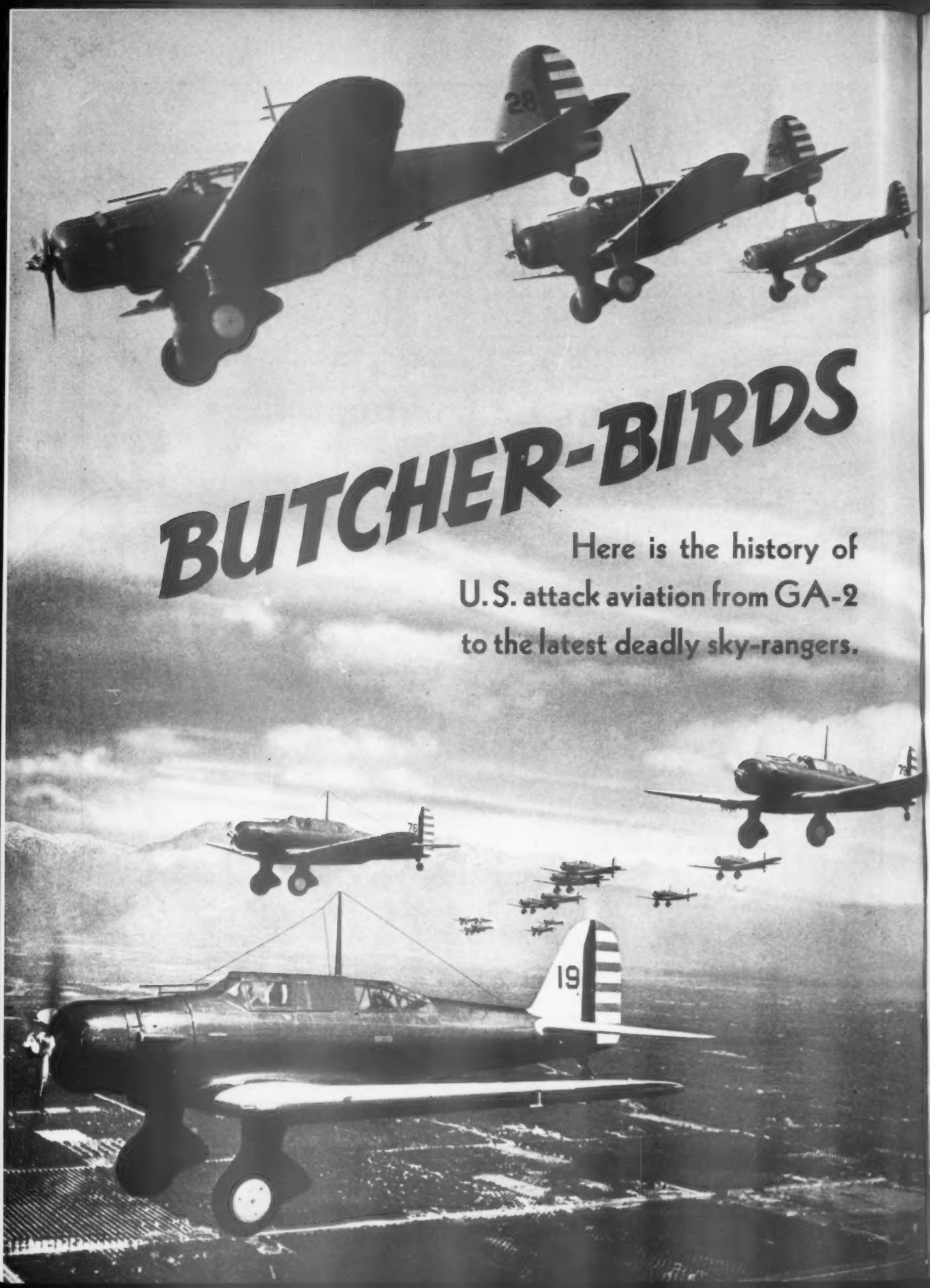


BUTCHER-BIRDS

Here is the history of
U.S. attack aviation from GA-2
to the latest deadly sky-rangers.

OF THE AIR CORPS

For sheer killing power, the pursuit and bombing plane has little in common with the attack plane's swift deadliness.

by ROBERT J. FENCL

THE advent of the Curtiss XA-14 attack plane in September, 1935, signalled the fulfillment of a goal the Army has striven for since the birth of attack aviation. In all probability the XA-14 will commence a cycle of types designed according to radical engineering principles; principles which nevertheless insure the attainment of complete tactical utility. The Army Air Corps now has, for the first time, an attack type that can carry out its mission in the manner recommended by the Air Corps for the utmost efficiency in the destruction of enemy morale and personnel; this by the simple provision of another engine and a resultant pursuit-plane speed.

The construction of the XA-14 type is a goal achieved, yet it does not mark the ultimate in the design of the attack plane. Rather, it has marked a milestone of achievement in its field and has beaten a path in the only logical manner —by application of another engine— toward the completion of the ultimate design in attack planes. It is fitting at this stage of development of so specialized a type that we review the growth of this weapon.

The first attack plane produced in the United States was an obscure product of the Ordnance Engineering Company of Baldwin, Long Island. It was a large, ungainly, two-seater biplane designated *Orenco, Type E.* Powered by a Liberty, the *Orenco* had a maximum speed of 130 m.p.h. and a time-elapsed climb of 10,000 feet in 18 minutes. Loggy on the controls and poor in performance, the Army lost no time in rejecting this type.

The year 1921 saw two notable attack ships take to the air: the Junkers-Larson JL-12 and the GAX.

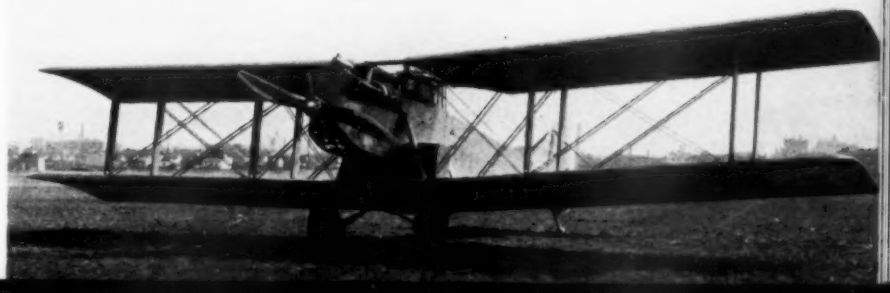
The JL-12 was discarded as unfit for service, but nevertheless it furnishes an excellent subject for discussion. Basically, it was an overgrown version of the successful, wartime Junkers CL-1. Larson was the American representative of the German company. The greatest point of interest in this design was its blood-thirsty complement of *thirty* Thompson machine guns. Two were affixed, in a slovenly arrangement, to fire out the windows, one to each side of the fuselage. The remaining 28 were mounted in the floor, 12 rigged to shoot slightly forward, six pointing directly downward and ten arranged to fire slightly to the rear. Control of fire was regulated through three triggers, a master trigger which touched off the entire battery, and two supplementary triggers, controlling respectively the right and left halves of the battery.

The wing span of the JL-12 was 49 feet, the length 33 feet, the loaded weight 4,800 pounds, and she was armored with one-eighth inch steel. The ground level speed was 140 m.p.h., the climb 1,000 feet in 46 seconds.

The GAX (Ground Attack Experimental) was a gigantic triplane and was destined to become the first attack plane accepted for service by the Army Air Corps. Ten additional models were built, designated GA-1.

In construction the GAX was unlike anything seen previously. She had been designed to operate unhurriedly regardless of the fire to which she was exposed and she was stressed and armored to fill the part. The wings were braced by a double bay of N struts and guyed by wires as further insurance against collapse. The fuselage aft of the cockpits was covered with plywood. The crew of three were encased at the sides in steel sheets 3/16 of an inch in thickness, as were the twin Liberties of 420 h.p. The bottoms of the motor nacelles and cab were fitted with ¼ inch armor. The armor was built integrally into the structure and totalled approximately one ton. The radiators were installed over the motors and the two four-bladed propellers were mounted as pushers. This arrangement was deemed the most logical means of reducing the effectiveness of a retaliative fire.

For armament the GAX carried eight Lewis machine guns and one 37 mm. Baldwin semi-automatic cannon. The cannon was mounted in the nose and could be fired into any section of the forward hemisphere. The gunner operating the cannon also had command of four Lewis guns mounted to fire forward and downward and of a single Lewis firing aft over the wings. The armament at the rear cockpit consisted of two Lewises firing through the floor and a single gun mounted above the fuselage to fire upward and backward. Provision



Though the JL-12 (right) looks even less like an attack plane than the GA-2 (below) that low-winged monoplane actually carried 30 sub-machine guns! The Boeing-built GA-2 gave many a daring Army Air Corps test pilot gray hair.

In attack aviation's embryo days, William E. Boeing played an important role. To him goes credit for the GAX, first twin-engined ship.

Douglas Aircraft also had a hand in the growth of attack aviation. The XA-2 above wasn't accepted, later became an observation type.

Most famous of the early attack ships was the Curtiss A-3 (above). On the other hand, Fokker's XA-7 (below) didn't meet requirements.

was made for a load of ten small fragmentation bombs and, in the event that these were to be carried, part of the armament was to be removed.

The maximum wing span of this juggernaut of the skies was 65 ft. 6 in., the maximum chord 6 ft. 8 in. The overall length was 33 ft. 7⅝ in. and the height 14 ft. 3 in. When loaded the GAX weighed 9,740 pounds, climbed 495 f.p.m. and sped through the air at 105 m.p.h.

With the perfection of the 800 h.p. "W" engine developed by its engineering division, the Army Air Corps drew up plans for another attack plane. Under the designation GA-2, two such craft were completed in 1922. Little of this type is known, as it dropped into obscurity almost at its inception. Several points of construction are of interest, however. The most arresting feature of construction was the duplication of all control-wires, guy-wires, struts and spars, so that if one was shot away, another remained to carry the load. Armoring was identical with that of the GAX, as was the number of occupants. The fuselage aft of the armored section was of steel tube construction, fabric covered. Other sections were of wood and fabric.

Two .30 calibre Browning machine guns and one 37 mm. Baldwin semi-automatic cannon were mounted to fire through the floor. For protection, two Lewis guns were carried on a Carff mount over the aft cockpit, mounted at a height that enabled the gunner to fire forward over the propeller as well as to the rear.

Two steel-sheathed radiators were mounted at the sides of the fuselage. The top speed was 110 m.p.h., the initial rate of climb 600 f.p.m. and the absolute ceiling 14,000 feet.

The ultimate attack product of the Engineering Division was the PG-1 (Ground Pursuit). The term signified an armored single-seater to be used against ground personnel in addition to its primary duty of destroying hostile armored attack-planes. Only one such airplane was built.

The PG-1 was constructed at the Boeing plant, as were its older sisters, the GAX and GA-2, with armoring identical to that of the two previous models described. The pilot sat with his head poked through the center-section. The radiator was placed at the leading edge of the center-section, this for protection against bullets from below. This arrangement seriously hampered the pilot's vision and bashed him in the face in a crash landing. In this model the Engineering Division veered away from multi-struts, a single V strut carrying the stress. The relatively small 300 h.p. Wright *Cannon* furnished the power. Construction was of wood and fabric. The PG-1 was shortlived, and in its passing in 1923 the Army turned to a different type of construction to solve the attack plane problem.

In 1924 the Army underwent a complete reversal in opinion and an effort

was made to bend a passable machine of another function to attack service with no armor carried.

At this juncture Anthony Fokker produced the V-40, a cantilever, veneer-covered-wing monoplane powered by the well-known Liberty. The European version of this model had for its motive power the 300 h.p. Hispano-Suiza. Features worth mentioning are the fuselage of welded steel tubing and the sheets of armor plating which were removable. This model was discarded early during preliminary tests, owing to the new policy which called for unarmored ships.

The first exhibition of the Air Corps' new trend of thought in regard to attack planes was the mounting of four wing guns and the equipping of light bomb racks on a De Havilland 4. Classing the DeH-4 as unfit almost from the first series of tests, the attention of the Army was next focused on the Douglas XO-2 of 1924. The attack plane version of the Douglas was known as the XA-2.

The Douglas product appeared at Wright Field in 1923, mounting two guns in the upper wing, two in the lower wing and two in the nose, all .30 calibre Browning type. In addition two Lewises were flexibly mounted over the rear cockpit. The motor, a Liberty, had been inverted and altered to an air-cooled type in an effort to dispense with the vulnerable radiator. Until the advent of the Curtiss XA-3 the Douglas was deemed the most promising of the attack-planes produced in this country. The dimensions disclose an orthodox design, the wings measuring 39 ft. 8 in. in span and the overall length being 29 ft. 7 in. The performance was creditable, the high speed being 134 m.p.h., the initial climb 800 f.p.m. Unsuccessful as attack planes, the DeH-4 and XA-2 nevertheless heralded the advent of the unarmored era of attack aviation.

In 1926 the Curtiss XA-3 *Falcon* was subjected to trials as a possible ground strafer. The A-3 was the outgrowth of the successful XO-1 of 1924 and it passed its illustrious forbear in fame. In appearance and general construction the A-3 had the lines that were to typify Curtiss military airplanes for the next four years. It possessed a pointed spinner faired into the nose which in turn was faired into an indentation at the base of the D-12 motor of 435 h.p. The radiator was installed directly beneath the power plant. The airfoil was a Clark Y with a .30 calibre Browning tucked into each lower wing, loaded with a 600 round belt. Mounted in the fuselage and firing through the propeller disk were two additional Brownings with 400 round belts. It was possible to mount a .50 calibre Browning in place of the right-hand .30 calibre machine gun, the receptacle fitting a 200 round belt of the larger calibre. For protection to the rear, a flexibly-mounted Lewis was carried together with 600 rounds of ammunition.

For light bombing attacks the A-3 carried two 25 pound fragmentation bombs, but two 100 pound demolition

(*Continued on page* 68)

The ship above is the currently popular Consolidated PB2-A in its earliest form. Lockheed had the design then and named it the XA-9.

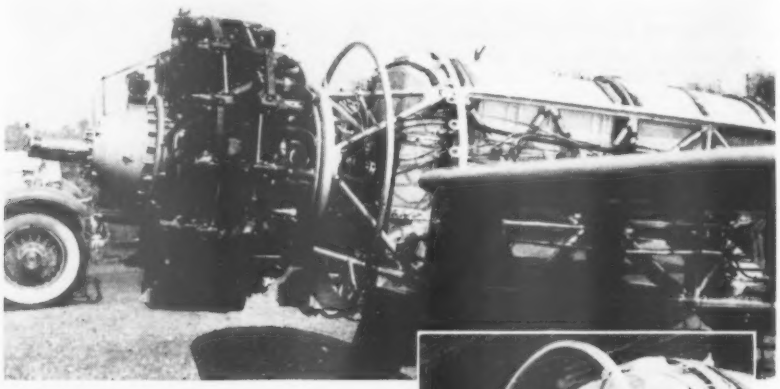
Most widely used American attack ship of a few years ago was this Curtiss A-12, better known as the Shrike. Many are still in use.

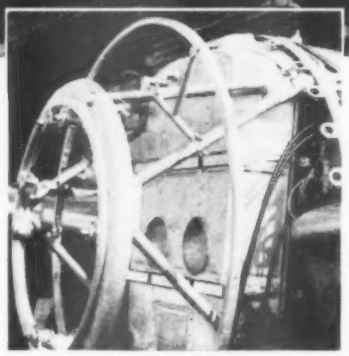
Latest version of the Northrop A-17 (see pages 10 and 11) is the A-17A (above). Still later and deadlier is the Curtiss A-18 (below).

Col. Roscoe Turner's "Meteor"

With bad luck having dogged him since the start of the late transcontinental speed dash, the famed Flying Colonel now is expected to go after inter-city records.

Turner and Matty Laird (in the cockpit) worked unceasingly on the new speed ship.





The husky two-row engine needed an exceptionally strong mount (above and right).

WITH a series of misfortunes forcing him out of this year's air racing competition, Colonel Roscoe Turner has yet to show the true ability of his new Turner-Laird racer as this is written.

Though both Turner and Laird are confident the new racer can hit 400 m.p.h., the former lost his chance to demonstrate this speed in the recent Bendix Trophy race from Los Angeles to Cleveland when a minor explosion in the ship's gasoline system forced the *Meteor* out of the race.

When he turned back on his course during the Thompson Trophy race when he thought he had cut a pylon, the showy colonel lost his last big chance of the year to out-fly others of the nation's top-ranking racers. Now it is generally believed that, to make up for the lack of winnings for the ship, Turner will go after several American and world speed records.

Though basically a conventional airplane, the Turner-Laird *Meteor* is an extremely interesting machine to muse over. Originally a product of the Lawrence W. Brown airplane company of Los Angeles, the ship was taken to Chicago early this year where E. M. "Matty" Laird, famed old-time designer and builder, was given the job of completing the ship.

There were lengthy wind tunnel tests in order to give the ship the maximum in strength to withstand the terrific forces exerted on it in racing and high-speed cross-country flying.

Powered with a 1,000 h.p. (at 2,300 r.p.m.) 14-cylinder Wasp engine, the *Meteor* is a full cantilever mid-winged monoplane. All construction details were placed and dimensioned to take the one main force at its full value. No one member can take two main loads. This resulted in a very rigid structure.

Sheet metal is used as fairing on the fuselage as far back as the trailing edge of the wing. From there back (with the exception of the belly which is covered with metal sheeting to protect it from flying stones) the fuselage is plywood covered.

Of especial interest to those concerned with airplane structures and stresses, is the *Meteor's* cantilever wing. It is of all-wood construction and has two solid 14-ply spruce spars. Plywood formers, cap-strips and spruce stringers all go to make up the wing which is fabric covered. The leading edge is metal-covered. Each wing section is secured to the fuselage by 16 bolts.

Ordinary wing flaps were added to the *Meteor* to reduce landing speeds and are built into the wing in much the same way as on modern airliners. They are manually operated. The ailerons are standard while in the tail unit, the construction is simplified by having the fin built integral with the fuselage. All control surfaces are hinged with ball bearings and the rudder and elevator are cable-operated. All controls are mass balanced.

Span is 25 ft., length is 23 ft., and the wing area is 95 sq. ft. The ship will carry 210 gals. of fuel.

Though they rushed to get the Meteor ready in time for the Bendix Trophy race, Laird engineers nonetheless did a thorough job. Above they are completing the fuselage.

TURNER-LAIRD "METEOR"

Two Old Timers

OUT of the past and an earlier era of aviation, there stepped into the limelight of the 1937 National Air Races, at Cleveland, two figures from the most important aviation story in the world.

They were J. T. Daniels and Adams Etheridge, two bronzed seagoing men—the last of that little band who aided Wilbur and Orville Wright to launch their first plane on that memorable 17th of December in the year 1903 at Kill Devil Hill, Kitty Hawk, North Carolina.

They had been brought here by plane—their first air trip—to be guests at the annual meeting of the Early Bird's organization.

"I remember that day very distinctly," related Mr. Daniels. "The Wrights had been using a glider for a long time and we were used to seeing that go up. When they thought they were sufficiently skilled in gliding, they set a signal one morning at 10 o'clock for us to assist them with the real powered machine.

We got the flying machine up on a track, eight feet long made of 2 by 4 scantlings. Then Orville and Wilbur went over to one side by themselves and hade a little chat together, quiet-like.

"I saw them throw a coin to see which one would go up first. I guess they both were anxious to try it but it came down in favor of Orville and he started right off in the machine.

"Yes, we cheered him all right, but there were only about six of us on hand and we didn't make much noise and, besides, we were used to seeing the glider go up, so we weren't so much impressed.

"Well, he flew about 12 or 15 feet, and then he came down and Wilbur took her up. He flew a half a mile across the beach. I started to run along under the plane, but I couldn't quite keep up.

"Pretty soon Wilbur got close to a sand knoll, and the rudder came off. I was standing on the lee side of her by then and she was as purty as machine you ever saw, until that happened.

"I jumped and tried to pull her down as Wilbur brought her down to earth again and she just seemed to go all to pieces.

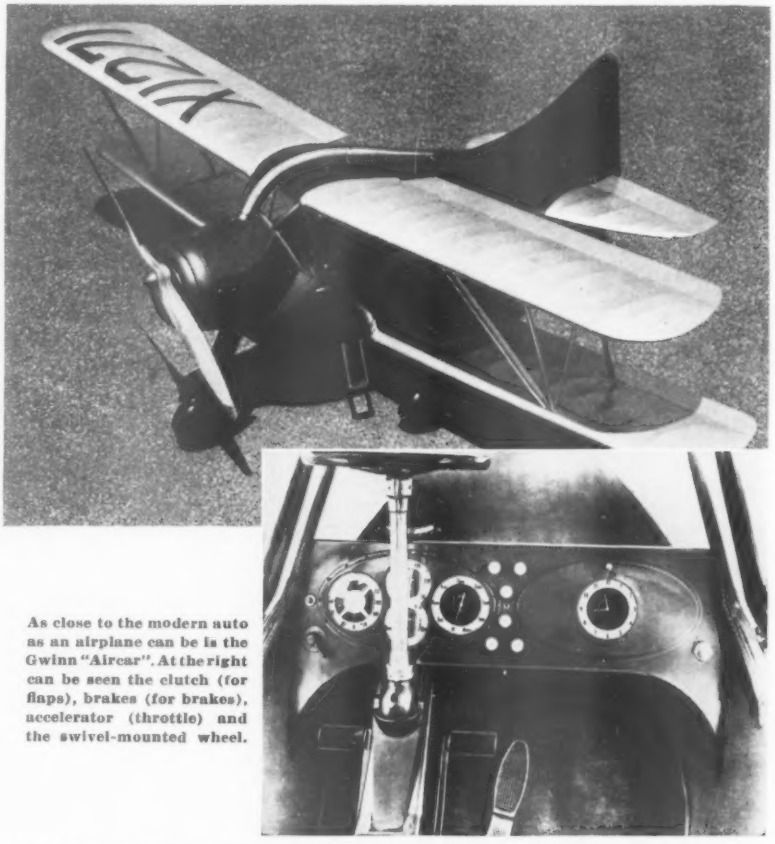
"She just cracked up. When I grabbed her, I was lifted off the ground myself for a minute and fell back into a sand dune."

"I guess neither Mr. Etheridge or I ever figured to go up in the air ourselves," he said. "When this invitation came, and they said we could come by flying machine, we talked things over and we decided we'd better not chance it. We said we'd stick to the bus or a train.

"Then we got to thinking it over and decided that if the Wright boys chanced it, we should, too. We got into the flying machine at Norfolk, and folks,—do you know it was the most pleasant ride we ever had. Why, when we got about to Pittsburgh I went sound asleep."

END

Our Front Cover: the Gwinn "Aircar"



As close to the modern auto as an airplane can be is the Gwinn "Aircar". At the right can be seen the clutch (for flaps), brakes (for brakes), accelerator (throttle) and the swivel-mounted wheel.

HERE'S the latest answer to the prayer for an-airplane-as-easy-to-operate-as-an-automobile: the Gwinn *Aircar*. And, as proof that this airplane is as close to the modern car as anything with wings can be, Designer Joseph Marr Gwinn, Jr., former World War pilot, has designed everything with the familiar automobile controls in mind.

The *Aircar* is no pipe-dream. Not only has this ship actually been built, it has been flown—and flies well, according to advance reports (see ". . . Clear and Unlimited" on page 37 of this issue).

First shown publicly at the National Air Races at Cleveland last month, the *Aircar* was privately test-flown at Buffalo, N. Y., by Lieut.-Comm. Frank Hawks, famed airman, some time ago. The ship is the result of four years' research and development work.

The *Aircar* is a two-place cabin ship designed to fit into any three-car garage. Only half the usual dual instruction time is necessary in learning to fly this ship, according to Mr. Gwinn. Powered with a British Pobjoy engine (later models will probably have American engines), the *Aircar* is expected to sell for less than a moderately-priced automobile. The landing gear is of the tricycle type, There is no tail wheel or skid nor is there a rudder. The steering wheel operates elevators, ailerons and the front wheel (for steering on the ground). According to Gwinn, it is impossible to stall or spin the *Aircar*. Flying the *Aircar* is probably the simplest of all. All travel is controlled in much the same way as driving a car. In handling, the ship is simply flown onto the ground. The pilot has only to level the ship off and hold it that way with the engine idling. The *Aircar* will do the rest.

The take-off of the *Aircar,* however, is somewhat unusual when compared to the conventional airplane. To take off, the engine is opened in the normal manner and, when take-off speed is reached, the left pedal (flaps) is pushed to the floor, lowering the flaps to take-off position. The take-off is immediate, although the ship will not stall regardless of what is done with the elevator. If the pilot pulls the elevator all the way back on the take-off, the ship merely does a short zoom from the field, then levels off automatically into level flight.

Top speed, according to Mr. Gwinn, is 120 m.p.h. Cruising speed is 109 m.p.h. and the *Aircar's* range is 495 miles. Wing span is 24 ft., length is 16 ft., and the total wing area is 169 sq. ft. Fully loaded, the ship weighs 1,600 lbs. With a useful load of 550 lbs., the ship carries 150 lbs. of fuel (25 gals.), 45 lbs. of baggage and pilot and passenger.

END

Airplanes of the White Eagle

by

HARRY G. VOGLER

THE great majority of the people of the United States are probably of the opinion that the aircraft manufacturing industry is practically dormant in the Republic of the White Eagle.

This opinion is not true, for Poland really holds a position that is envied by the other nations of Central Europe. There are several well known aircraft manufacturing firms operating in this nation who are turning out a popular type of plane for the Continental pilots.

Podlaska Wytwonia Samolotow, under the leadership of August Zdaniowski, is producing planes that have gained an enviable reputation and we find that one particular ship, the PWS-16, designed for aerobatic work has gained a name that will be remembered for a long time.

This PWS-16 is of biplane design, constructed of wood and has the lower wing mounted on the bottom longerons of the fuselage. The two wings are joined together by "N" struts. The fuselage is welded steel tubing.

The plane is fitted with dual control, having both pits equipped alike for the control of the plane. This type plane is powered by a Wright 220 h.p. motor, built in Poland under license. The tare weight of the PWS-16 is 1,720 pounds, with a useful load of 705 pounds, which permits an all-up maximum weight of 2,425 pounds.

The span of the wings is 29 ft. 10 in. having a wing area of 273 sq. ft., which permits a wing loading of 8.8 pounds per square feet and a power-load of 11.0 pounds per horsepower. The length of the fuselage is 23.1 feet, while the overall height is 8 ft. 10½ in.

A maximum speed of 135 m.p.h. is attained by the PWS-16, while it cruises at 120 m.p.h. The ship can climb to 950 feet in the first minute of flight, and requires 16 minutes and 18 seconds to reach 10,000 feet. The service ceiling is 14,500 feet.

Another of the planes that has gained a reputation for itself is the PWS-10, a monoplane designed for the Polish Air Services, and powered by an in-line Lorraine water-cooled motor of 450 h.p. The plane has an overall length of 24 ft. 8 in. with an overall height of 8 ft. 10 in. The span is 36 ft. 4 in. with an area of 196 sq. ft.

The tare weight is 2,546 lbs. and it has a useful load of 750 lbs., which permits a maximum load of 3,300 lbs. The cruising speed of the PWS-10 is 150 m.p.h., while its top speed is close to 175 m.p.h.

END

One of Poland's standard military fighters is this PWS-10 powered with a 450 h.p. engine.

Popular as a training plane, this RWD-8 is widely used. The engine is a 110 h.p. Walter.

Closely resembling the Fokker monoplanes, the PWS-24T carries four passengers and pilot.

Not unlike the American Travelair and Stearman is this aerobatic model, the PWS-16.

Save

IN my somewhat spotty profession as a writer of air adventure stories, I probably get the most amazing pile of mail over a 12 months' period that could be collected anywhere else in the country. But, at least once every day, I can figure on a pathetic note from some lad who wants to go away and fight someone. We who threw our futures to the four winds back in 1914 and hurled our manly bodies into someone's army to avenge Brave Little Belgium, or whoever it was we went over to fight about, have a grim responsibility resting on our shoulders. We were the ones who started all this, and in a somewhat roundabout way, I am getting some of it back.

As I said, at least once a day I get a letter from some lad who wants to go to China, Spain, South America—or Poland. Just what the Polish angle is I've never been quite able to fathom, but some of them want to go to Poland.

They want to know whom they must write to to get into the Peruvian air force. They want to know how much a pilot would get flying for Chile. They want to know what machines they use in the Chinese Nationalist Army and if it is true that captured airmen in the Spanish omelet are usually bumped off after they have been pumped for all the information they can splutter.

It's all pretty pitiful, or would be if it wasn't so serious.

So what? What do I tell these adventurous souls? What can I tell them?

First off, I try to be honest with them and justify their confidence in me, so I give them all the information I can collect, then in the last paragraph I come out flat-footed and tell them to forget it; that they haven't a chance in the world and recite several incidents gathered from friends who have been in Spain, China and even down in the Chaco.

Sometimes they write back and thank me, but more often they resent my advice. Now and then I hear from the "misunderstood" lad who wants to go off to the wars because no one at home gives a hang about him. They—his family—often go to the extremes of expecting him to get a job and go to work. Sometimes the love complex seems to enter the picture, but I usually draw the line at those problems.

But my advice is to stay out of China. That's a real war over there. None of your cheap South American revolutions of the O'Henry caliber. It's nothing like the mess we got into over in France. There we were mixing with our own kind, even though some of them spoke French or Flemish. The lads in the French Foreign Legion were not particularly poverty stricken and, what helped more, they at least had a reasonable and understandable quest in mind. They honestly believed that Germany had torn up a treaty and they were subjects of the citizenship of Youth who were expected to do something about it. Let the anti-war crowd call it what they like and let them taunt us with the old song that we fell for the propaganda merchants, but we who went over in 1914 are still secure in our belief that it was the cleanest thing we ever did.

This Chinese thing is something else again. Granted that Japan is invading China. Granted that they are bombing defenseless towns and battering civilians to pulp. Nevertheless, it is still something we should stay out of, because so far none of us know what it is really all about. We cannot plumb the Oriental mind and the Occidental is as far from understanding us.

Hundreds of trained aviators in the United States and Canada have been approached by members of Chinese anti-Japanese societies and asked to go to China and help strengthen the Chinese air force. A number—possibly 200—have already gone and by the time this appears in print you may read some of the official details when the big blow-off comes.

A great number risked their national status and spent their last penny in hopes of getting into action in Chinese skies. Many of them today are haunting

The war in China is no pink tea. Bombers (above) and guns (below) are the latest.

Your Bravery

Stay Home, You Air Heroes!

If you're one of those daring young battle-loving airmen who would like to fly in either the current Chinese or Spanish wars, you'd better read this article with the utmost care.

by ARCH WHITEHOUSE

American-built Chinese Curtiss fighters like this must battle Japanese armadas.

American business houses in China and not a few are working as mechanics in Chinese garages.

They believed that a mysterious organization known as the National Salvation Society in Shanghai would be awaiting them on the dock at Shanghai. Fabulous monthly pay checks would be theirs once they joined up and went into action. There was smooth talk of bonuses, just as there was in the Spanish affair. They were told that they would fly first-class American-type pursuits or up-to-date Italian two-seater fighters. They would be hired on a month-to-month contract and not lose their American citizenship.

That was the biggest joke of it all. They had forgotten all about the Robert Short case in 1932. There was one for the books, for any American to read and digest—but 1932 is five years back and we soon forget.

Perhaps you've even forgotten. Bob Short was a young American test pilot attached to an American aircraft importing concern in China. Bob was in no way connected with the Chinese army, but he was ordered to fly a new Boeing fighter up to Nanking and deliver it to a Chinese squadron there.

The trip from Shanghai was uneventful and he brought the ship down at Nanking safe and sound. He was supposed to return to Shanghai by train, but during the short period in which he gave a couple of Chinese officers a general explanation of the gadgets and other necessary information concerning the motor and guns, a formation of Japanese two-seater bombers came over and started disturbing the turf around the field.

The rest of the story I got from Harrison Foreman, the noted explorer, who was at Nanking when all this happened. Foreman showed me Short's pilot's license which he saved after the incident.

Short, realizing that here was a fine chance to show what the Boeing could do, urged one of the Chinese pilots to take it up and drive the Japanese off. But the Chinaman "was not buying any" that day and suggested that, as Short represented the firm that was selling them, he should take it up and *drive the Japanese off*.

Bob required no great amount of urging. He had been trained in the American air service and knew how to handle the Boeing. He took off, caught the Japanese bombers and fired on one and shot it down in flames. Then he made the mistake of attempting to dive on another from above and behind instead of from below and behind, getting in the gunner's blind spot.

The rest of the story is pretty pathetic. Short was shot down, probably killed in mid-air, and by then the diplomatic fat was in the fire. Someone wanted to know why an American citizen was flying a Chinese war plane against the Japanese. There was no sane answer anywhere, but while they were all asking questions, someone with quick wit inscribed Short's name on the official Chinese army air service rolls and he automatically became a subject of China—to keep America out of a pretty sticky international tangle.

This is what will happen to those brave spirits who attempt to join the Chinese air force:

There will be no contract arrangements. Once you sign to fly, you sign your birthright away and all the American consuls in the world won't do you a bit of good. If you want further proof of this look at the Harold E. Dahl case now being shuttled back and forth between Washington and Spain. Dahl, an American citizen, was flying for the loyalist forces

An American airman is *not* the equal of any ten foreigners. They *all* die just as dead.

and was shot down in the insurgent lines. Once captured he was closely questioned, given what went for a military trial, and sentenced to death. At this writing he was appealing, or his wife was, to American representatives to get him out of it.

Those with sound judgment, unhampered by sentiment, say that Dahl had no legal right to appeal for American assistance as he was no longer a recognized citizen of the United States. Be that as it may, the Dahl case is just another item in the long list of evidence piling up against this idea of jumping into anybody's war.

The Spanish affair is bad enough, according to those who have been there, but the Chinese mess can be a thousand times worse.

First off, the chaotic conditions of the Chinese government are not conducive of secure standing. You may be a lieutenant under one war lord and a greaseball under the command of another. Their attitude toward the "hired" fighter is not as flexible or benevolent as that shown by the British or French in the World War. The Oriental mind cannot understand the sporting venture of the soldier of fortune. He is just another hired human being—and no different from one of the nags that lugs a three-inch gun out of a rice paddy. The American may work himself up to believing in an ideal, but the Oriental can only compute in the terms of war. They will take prisoners if they can use them, but once they become useless hungry mouths to feed, they are eradicated in a business-like manner.

Next, the American soldier of fortune must get rid of the idea that he is as good as any ten Japs—or any other race for that matter. He is as good, broadly speaking, as any other man. But he is no superman, in spite of the aura that fiction writers like myself are prone to blanket him with. Man for man, gun for gun and plane for plane, you can bet on him—but you might make a mistake as did Bob Short.

The Chinese have an air force and a fairly good one, but at present, *they have more of their own pilots than they know what to do with.* Their present standing is about 700 so-called first-line planes, and they have more than 1,200 trained army pilots on their lists. Should any Americans wangle their way into the Chinese service, they *might* get a crack at the enemy in a Curtiss *Hawk* or a Northrop fighter, but the chances are that they will be sent into action flying delapidated old Douglases of 1927 vintage, just as the American volunteers in Spain had to fly the 1925 Nieuports and Breguets while the Spanish airmen got the Russian Curtiss-type fighters.

Not only do the Japanese have little respect for enemy airmen captured, the Chinese are no more gallant, in our terms of warfare. A glance through the records of the 1932 "war" will show what the Chinese have done, and which must

(*Concluded on page* 76)

Flying to Bermuda by Clipper Ship

by Helen Waterhouse

JULY 29.—Ten hours from Akron, Ohio, to the islands of Bermuda. Ten hours on a trip which would have taken by rail and steamship at least 55 hours.

It was the fifth flight to the island of the great Pan American clipper ship which is uniting two great nations of the world in a common pioneering venture. For while the giant flying bird of the American company took me to that treasure island on the North Atlantic, it was the mighty *Cavalier* of the British Imperial Airways which brought me back to New York again.

In other words, aviation has accomplished the miracle on this new Bermuda service, by uniting England and America in this air enterprise. The two great companies operate out of the same terminals at either end of the lines, the same uniformed officials greet you whether you are flying British or American, and even the two publicity offices confer back and forth and cooperate in every way they can—instead of trying to compete with each other.

In fact, the schedules are printed on the same time-tables with alternating trips.

As Joseph Otterbridge of the Trades board in Bermuda puts it, "Here in this island where English interests are so closely guarded and preserved, we are encouraging the Pan American service—the first American air service ever to operate here. We feel that the British and American companies can work in close harmony for the benefit of us all. We here are glad of the closer-knit relationship."

But to get back to the trip itself.

It was towards midnight when I left the rubbery odor of Akron behind in a plane, which Akron's "flying grandmother," Mrs. Louise Van Cantfort, had chartered in celebration of her 82nd birthday, for a hop to Cleveland. And at Cleveland, this woman who took her first flight at the age of 80, waved me goodbye as I stepped aboard the United Air Line's Douglas, New York-bound.

I found the naval attache to President Manuel Quezon of the Philippine Islands was my seat mate on this trip. In a few hours he would be on the high seas with General Pershing, bound for Europe, he said, where an American war memorial was to be dedicated. And about the time he sailed, I would be winging to Bermuda in the clipper ship—for such is the fast moving kaleidoscope of air travel, I reflected.

At 7 a.m. I had crossed New York to Port Washington, Long Island, where in the brilliant morning sunlight, the great clipper lay at the end of the pier, tuned for the hop.

Behind her in the lock was her cousin ship, in which Captain Harold Gray had just made his epoch-making flight across the Atlantic.

White-clad crew members were bus-

And here is the author in full control of a one horsepower rawhide engine.

tling about on last minute errands. Captain R. O. D. Sullivan, veteran World War flyer, in charge of this clipper, in his neat white uniform, greeted the 14 passengers, then went on to direct his eight crew members inside the ship.

The passenger list included several Bermudan business men, one of whom is so thrilled with the new service, that he has actually flown every one of the five trips from the island, and has even taken his family along, too, on at least one flight. New York business men, whose families are summering on the island, and tourists from various parts of the States and Canada all welcome the service. It was a mixed crowd from far-flung places, but at the end of that trip all were fast friends, and there were several "reunions in Bermuda" in the days following our landing.

Each of us was assigned to a seat in a neat compartment, much like an English train compartment, for the take-off and landing, but during the trip were free to roam through the spacious cabins at will—to play cards, or read, or lounge, or simply look, as our fancy dictated.

Just before the take-off the steward came through and closed all port holes and windows until we should be aloft. Slowly and majestically we taxiied out across Long Island bay—

Then suddenly, the big bird gathered speed, swung around and took off in a splash of spray which completely obliterated the windows for a moment.

And from then on, this pioneer voyage became merely peaceful smooth sailing through billowy clouds over limitless ocean waves, with strong breezes blowing through the cabin, on an 80 degree day.

Once we saw where the Gulf Stream cut a wide white swathe in the water far beneath. Once we passed over a ship lumbering along—and we made the discovery that the rainbow has no end after

(*Concluded on page* 81)

Sikorsky's Latest: the XPBS-1

Uncle Sam's Navy boys are always good for an aeronautical secret. This latest long range patrol bomber was such a well-kept secret that few knew the design existed.

IGOR SIKORSKY has always said that he could build a flying boat of "impossible" proportions if someone would just give him a contract. On this page is a bit of conclusive proof that Sikorsky knew whereof he spoke when he stated he could build a boat "right now" that could out-Clipper his own S-42 Clippers.

But U. S. Navy airmen are quick to grab a good thing. So, instead of sailing easily across an ocean with a freight-train load aboard amid reams of newspaper fanfare, Sikorsky's latest boat is shrouded by the U. S. Navy's ever-present status of wartime operations.

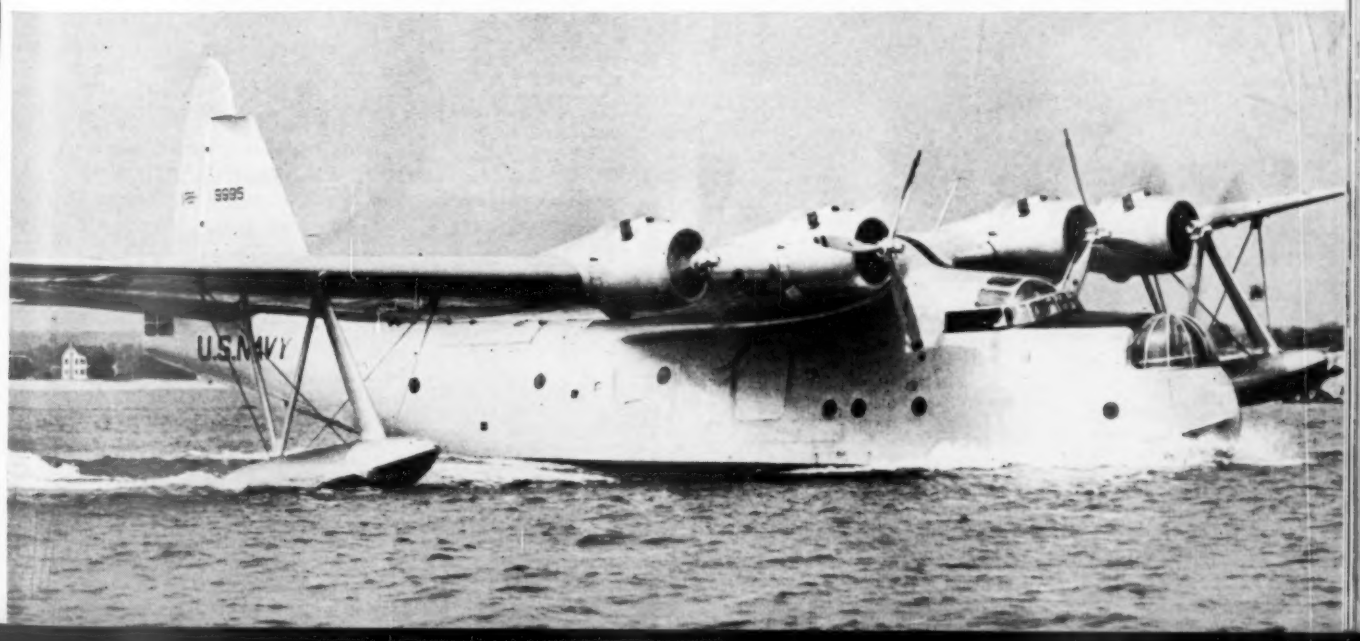
Not much in the way of pertinent information is known about the XPBS-1 (Experimental Patrol Bomber Sikorsky-Model No. 1). The Navy has announced, however, that the ship is a four-engined (1,050 h.p. *Twin Wasps*) all-metal, high wing, full cantilever monoplane flying boat "of new design." The construction of this plane was undertaken by the Navy in an effort to explore the value of large flying boats in national defense.

Though the Navy naturally will release no pertinent figures on the ship, they do state that the XPBS-1 is "one of the most powerful bombing planes in the United States, having a military load-carrying capacity comparable with that of any known existing airplane."

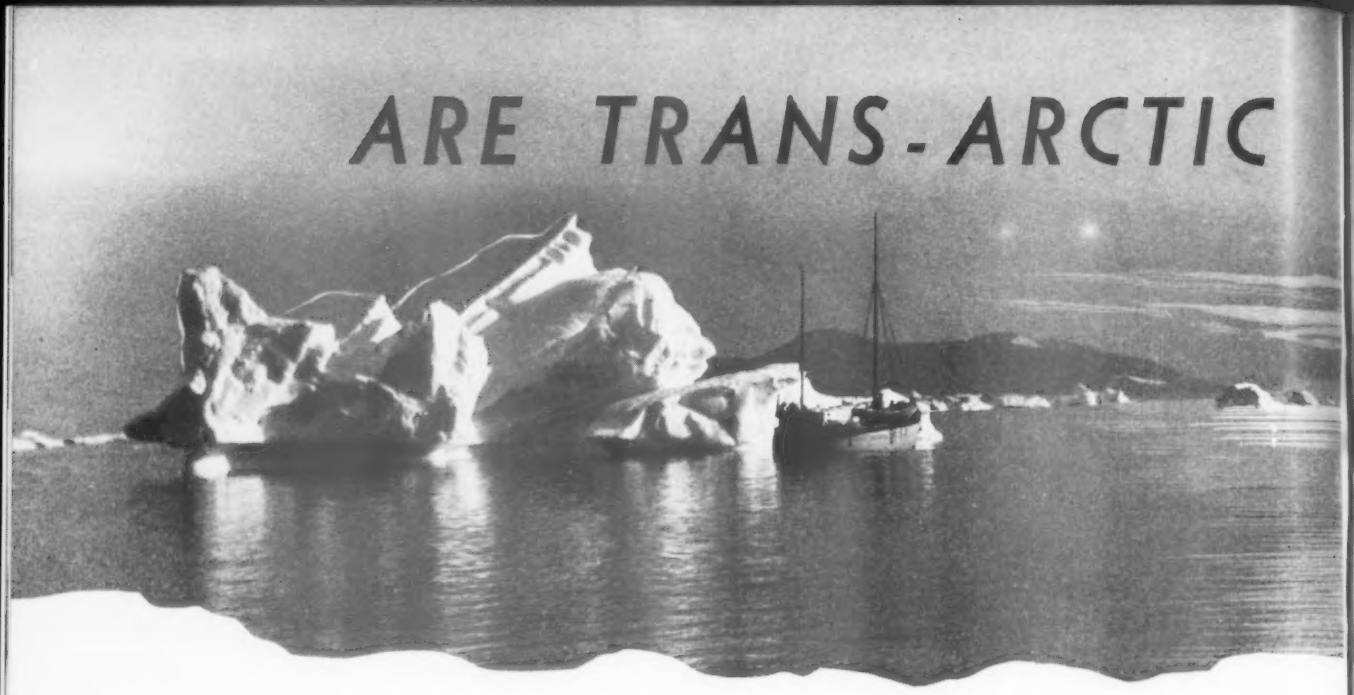
It took two years to design and build this giant. Nothing was overlooked. A complete radio compartment is built into the ship with equipment comparable to a full size destroyer. There are living quarters for the crew, a mechanic's workshop, galley with an electric stove, a water distiller and dry ice refrigerator.

The XPBS-1 exceeds other Sikorsky boats in size by *five or six tons*. Like Boeing's mysterious B-15 bomber, a complete electrical system is installed which operates independent of the engines.

First test flights of this long range naval bomber were conducted at Bridgeport, Conn., recently by Sikorsky engineers. After the Navy officially accepts the ship, naval aviation officers will run exhaustive tests in the Norfolk, Va.-Washington, D. C., vicinity.



ARE TRANS-ARCTIC



THE recent achievements of the Soviet flyers, first in landing a number of powerful airplanes upon the sea ice of the Arctic basin near the North Pole, and then the two flights from Moscow to our Pacific coast area, mark a definite milestone in the development of aviation. It has in this way at last been amply demonstrated that the conditions over the Arctic basin are not unsuitable for flying by modern planes, and it does not admit of doubt that, remote as the area is from the centers of civilization, the hazards of the flights are much less than those across the Atlantic or Pacific oceans. A forced landing upon firm sea ice is much to be preferred to one on the bosom of the unfrozen sea. Search is now being made for the flyers of the third trans-Arctic group, who were forced down and will probably be rescued in spite of the failure of their radio to work.

As long ago as 1910, the year after he had reached the Pole, Peary expressed his conviction that the airplane would become an important means of exploring the polar regions, and a few years later he said:[1] "I have no hesitation in saying that airplanes will not only cross the Atlantic and fly around the world, but cruise to the North Pole across the polar basin within a very short time."[2]

Though the full demonstration that was needed has now been supplied by the Soviet flyers, the route which they followed is one of little significance, and it is likely to be so in the near future. It does not very greatly reduce the established route distances, and it connects sections that have little business relations with each other.

A trans-Arctic route with vast possibilities is that which connects the great business section of the northeastern United States with the Far East, especially China, and on this line the distance along established routes would be cut more than half, 6,800 instead of 15,000 miles (Fig. 1); for New York and Peiping (or Tientsin) are separated by nearly 180 degrees of longitude (New York 74° W and Peiping 115½° E, difference 179½°). The Great Circle route which connects these metropolitan centers[3] is one especially favorable to flying. It possesses the unique quality of passing over the North Magnetic Pole, so that navigating difficulties are reduced to a minimum. In crossing the Arctic basin along this route, which from March to September is so generally enveloped in fog, blind flying is reduced to following the North Pole of the compass needle until approach to the Mag-

Many valuable miles and hours will be saved by flying the routes shown in Fig. 1 (left). That the North Pole is no unconquerable waste was proved recently by Russian ace M. V. Vodopyanov (below, right) shown at the Pole with his navigator and plane.

The big Russian airliner below is standing on floe ice. Note weight tied to wing.

AIRLINES NEXT?

A world-famed authority on the Arctic discusses the icy waste that is destined to be aviation's next great frontier. Here is a far-reaching prediction by

WILLIAM H. HOBBS

netic Pole. The difficulties which would otherwise be encountered because the variation of the compass needle is not known within the area, thus largely vanish for this particular route. The territory covered would be under either Chinese, U.S.S.R., British or American sovereignty.

From Peiping to Chita (which is the junction of the trans-Siberian and Chinese Eastern railways and only 270 miles east of Irkutsk, the center of flying routes in East Siberia) is 750 miles and passes throughout to the westward of the boundary of Manchukuo. Chita would serve as a U.S.S.R. customs inspection station and be supplied with fuel. It would also serve as weather, radio and beacon station (Fig. 2).

The second leg of the flight is one of 850 miles and passes over the generally flat plain of Siberia to Viliuisk on the Viliui River, which is a branch of the Lena. This station can be furnished supplies from Yakutsk and would be weather, radio, fuel and beacon station. Tixy Bay is the next station 600 miles distant and a port at the mouth of the Lena River with all necessary supplies.

The next leg is of 350 miles and ends on Norpalakh Bay on the west side of the northernmost large island of the New Siberian group, Kotelnoi, which is about 300 miles off the mouth of the Lena River. It has several times served as an Arctic expedition station and can be supplied from Tixy Bay. This station on Kotelnoi would supply fuel for the longest leg across the Arctic and should likewise be a weather, radio and beacon station. One hundred and fifty miles further on the route Bennett Island should in good weather be in view 100 miles to the east and Sannikov Island 50 miles west.

The principal hop of the flight is one which passes about 600 miles on the Alaskan side of the North Pole to Borden Island (1,500 miles), which could doubtless be made a weather, radio, fuel and beacon station. Dr. Stefansson, who discovered this island, reports much of it as rolling prairie and swampy, but thinks that planes provided with either wheels or skiis could even in its natural state make a landing and take off again with light loads.[4] Borden Island is provided with a large bay, Wilkins Sound, protected from the pack ice by Brock Island and hence not subject to the usual shifts of the pack under the influence of storm winds and tide. The plane would next proceed direct to Fort Hope, a flight from its last fueling station of roughly 1,000 miles.

(Please turn the page)

Even present-day ships like Dick Merrill's trans-Atlantic Electra can fly the Arctic.

Chicago and New York are in an excellent position to handle trans-Arctic airline traffic. Two of the author's proposed routes are shown on the map (Fig. 2) at the right. Note the comparatively short airline distances between refuelling stops.

Fort Hope is a regular station of the Hudson Bay Company and is supplied by the Hudson Bay Company's small schooner from the railhead of the new railway to Churchill on the northwest side of Hudson Bay. It would be for the flying route Canadian customs inspection station, provided with fuel and also constitute a radio, weather and beacon station for the route.

From Fort Hope the route to New York is across Hudson Bay to Richmond Gulf (800 miles) on the east coast (already a station of Canadian Airways, Ltd.) and thence to Rupert House at extreme south end of James Bay (350 miles). The next hop is to Montreal (380 miles), and the final short leg from Montreal to New York City is about 300 miles.

In summary:

Peiping to Chita.....	750 miles
Chita to Viliuisk.....	850 miles
Viliuisk to Tixy Bay.....	600 miles
Tixy Bay to Kotelnoi.....	350 miles
Kotelnoi to Borden Island...	1,500 miles
Borden Island to Fort Hope.	900 miles
Fort Hope to Richmond Gulf.	800 miles
Richmond Gulf to Rupert House	350 miles
Rupert House to Montreal...	380 miles
Montreal to New York.....	300 miles
	6,780 miles

At the present time the *China Clipper* (see dashed line of Fig. 1) makes the trip from San Francisco to Hong Kong in six days (Wednesday to Wednesday). One additional day must be added for the flight from New York to San Francisco, and another for that from Hong Kong to Shanghai or Tientsin. This makes a lapse of time of eight days in all. The trans-Arctic flight as above outlined should reduce this time from Peiping to New York City to from three to four days. The Soviet flyers of the second group made a trans-Arctic flight of 6,625 miles in a little over 61 hours, a distance 155 miles shorter than the here projected route. This is a little over 2½ days, though made without stops. As compared with the hazard of a forced landing on the broad Pacific, that of a landing on the sea ice of the Arctic basin is small by comparison and the largest hops of the *China Clipper* are of 2,000 and 3,000 miles. The navigation problem is, as above stated, for the trans-Arctic route to a considerable extent eliminated, and with flights made at considerable altitudes (the first group of U.S.S.R. flyers crossed the North Pole at 12,000 feet), as would be desirable above the Arctic archipelago from Borden Island to Fort Hope, a distance of roughly 1,000 miles, the broad plan of the archipelago further makes position finding relatively easy.

Examination of the map will show that this trans-Arctic route crosses a large unexplored area of the Arctic sea within which, in the opinion of the writer, land is likely to be discovered

(*Concluded on page* 58)

New Ships on the Paris-Marseilles Lines

by R. C. Wood

This new high-speed Bloch 220 has just been placed in service between Paris and Marseilles. This ship is powered with two 880 h.p. engines. Maximum speed is 219 m.p.h.

IN ORDER to meet the requirements of a constantly increasing business between Paris and Marseilles, the Air France has just put in service the new fast, low wing twin engine, passenger transport monoplane, the Bloch 220, the first of a series of eight machines ordered by that company and now rapidly nearing completion.

This new plane, with Gaston Durmon, Air France chief pilot, at the controls made its maiden round trip Paris-Marseilles-Paris, a distance of 730 kilometers (456 miles), going and coming, at an average speed of 285 k.p.h. (179 m.p.h.).

In addition to the crew, consisting of Chief Pilot Durmon, an assistant pilot-radio man, a mechanic and a bar man, the machine transported 14 passengers and a load of about 1,000 lbs.

It is announced that for the present at least, this new Bloch plane together with the others as they are received by Air France, will replace the Potez high wing, twin engine, monoplanes No. 62, on the Paris-Marseilles line. The Potez planes transport but 12 passengers and cruise at about 235 k.p.h. (145 m.p.h.).

The Air France operates two daily services between Paris and Marseilles, this line being the second in importance of its far spread system, both as regards traffic and passengers carried.

These new Bloch 220 transport planes are equipped with Gnome & Rhone 14-cylinder, double-row, radial aircooled engines of 880 h.p. each, supercharged to establish their power up to 1,500 meters (5,000 ft.) and fitted with Ratier three-bladed, electrically operated variable pitch airscrews and cylinder shaped NACA cowlings.

These new planes have shown a maximum speed in their trial tests of 219 m.p.h. (350 k.p.h.) at full throttle and a cruising speed of 171 m.p.h. (300 k.p.h.) when using only 58 per cent of their engine power. The machines can take off and fly on one engine. They are of metallic construction throughout.

The wings have a span of 73 feet (22 meters 800) and a surface of 780 square feet (72 square meters). They are constructed in three sections: a center and two outer panels, with two spars and a metallic structure throughout covered with a stress carrying skin.

The center wing section has a rectangular shape and extends through the lower part of the fuselage. The chord at the wing roots is 12 ft. 4 in. The outer wing panels are mounted at a dihedral angle of 10° with the center-section.

They have a trapezoidal form with a taper on both their leading and trailing edges and terminate in square tips with a chord of 6 ft. 10 in. The ailerons have a surface of 32 square feet (3 square meters) and extend inboard 16 ft. 4 in. (5 meters) with an average chord of 2 feet (0.6 meter).

The trailing edge of each wing is equipped with split flaps, with a chord of 2 ft. 3 in. which extend inboard from the ailerons 10 feet on each wing. Both ailerons and flaps are electrically operated.

The fuselage is of semi-monocoque metallic construction 61 ft. 10 in. (18.5 meters) in length with straight sides and covered with a stress carrying skin. The top and bottom sections are slightly rounded in form.

The cabin is situated over the center of gravity of the plane and is divided into two sections. The forward part is fitted to accommodate six passengers and the rear section for ten people.

The dimensions are as follows: length (two sections) 26 ft. 7 in. (8.2 meters), width 5 ft. 6 in. (1.7 meters), height 9 ft. 6 in. (1.9 meters). The pilot and radio operator are installed in the nose of the plane.

The landing carriage is of cantilever construction with a wide track. It is retractable, operated by compressed air and pulls up into the wings behind the engine nacelles.

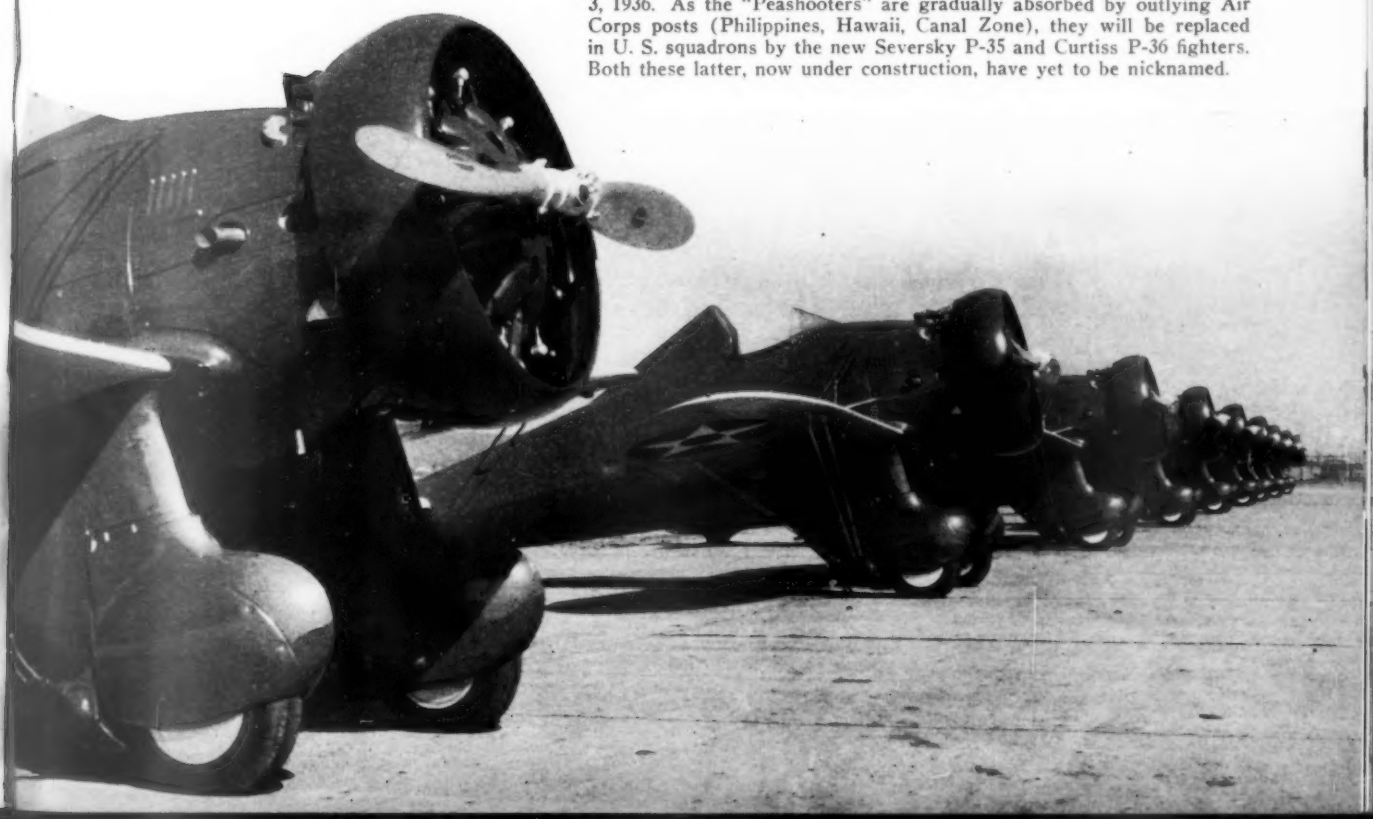
The fixed horizontal stabilizers are reinforced by struts on each of their lower sides. The vertical fin has a cantilever construction with a large aspect ratio.

(*Concluded on page* 58)

PEASHOOTERS for the PHILIPPINES

YOU POPULAR AVIATION readers who pride yourselves with the ability to identify military aircraft in this country by their official designations (P-26, P-35, B-17, F13C-3, etc.) will have to resign yourselves to the fact that, so far as Air Corps men are concerned, the airplanes now being shipped to the Philippine Islands are "Peashooters", not Boeing P-26 fighters. Like the Boeing "Flying Fortress" (nicknamed "Jeep"), the P-26 is affectionately known to Army flying men as "Peashooter".

After several years' service in this country, American Army squadrons in the Philippines will now be flying these ships. The P-26 has made an enviable record for itself. The Boeing company built and delivered 136 of these ships to the Air Corps, the last one leaving the factory March 3, 1936. As the "Peashooters" are gradually absorbed by outlying Air Corps posts (Philippines, Hawaii, Canal Zone), they will be replaced in U. S. squadrons by the new Seversky P-35 and Curtiss P-36 fighters. Both these latter, now under construction, have yet to be nicknamed.



THE ADMIRALS' Patrol

A mere 25 years ago Glenn Curtiss built Navy Flying Boat No. 1 (above). From No. 1 to PBY-1 is a fascinating story.

TWELVE high performance patrol planes of the U. S. Navy again have calmly winged their way, non-stop and in formation, over the Pacific, from the west coast of the United States to Honolulu (over 2,500 miles), for the purpose of delivering new aircraft to the aircraft squadrons operating from the Fleet Air Base at Pearl Harbor; the scheduled flights of the Pan American Clippers between the United States and the Philippine Islands being carried out, both of them without benefit of undue newspaper headlines.

Many people have recently started to "sit up and take notice" of the fact that, while they have been reading of spectacular dashes of tiny, high-powered racing planes (beautiful demonstration of material, dependability and personal endurance, by the way) that tortoise of aircraft, the flying boat, has been slowly but surely growing up.

Aviation has always, and naturally so, been associated with speed. The speed of a star shooting through the open skyways —a freedom to fly, faster and faster— until the point was reached where speed was forced to stop and wait for company in the form of reliability, safety and endurance.

This realization came as the result of very simple reasoning: of what benefit to transportation was an airplane capable of traveling 300 m.p.h., if it could carry only the persons required to fly it? To carry passengers meant a larger plane; a larger plane meant more weight to drive through the air, and more weight meant sacrifice of speed if range were to be obtained. With passengers traveling in comfort across the seas speed, distance, and safety all had to be considered if flying boats were to take their place as a means of transportation, and speed was the only factor the flying boat could offer which was not already possessed by the surface ships.

Because dreams of the pioneers in aviation have come true, as the result of a methodical, sane development, we have been but vaguely conscious of the happening. To understand more fully we must turn back a quarter of a century and meet a few of the men who dreamed those dreams and see again the startling aircraft which they designed as the first wedge into that unknown sphere. Starting from scratch these early pioneers worked out with their own hands the first steps toward the vision of fleets of flying boats winging their way across the seas. That their ideas were sound is proven by the fact that fundamentally the forms of the hulls of today's flying boats are the same as those worked out in model basin tests inaugurated by the U. S. Navy in 1911 at the Washington Navy Yard. Those early experiments were initiated by the late Captain W. I. Chambers, a man about whom the avia-

The famed "America" (above), originally built for Rodman Wanamaker, served as the basic design for many a later Curtiss flying boat. Its wing span was 72 feet.

Old-time Navy airmen remember the MS-1 (right) very well. This boat served the air-minded admirals back in 1917 as well as the Allies in patrolling wartime waters.

Boats PASS IN REVIEW

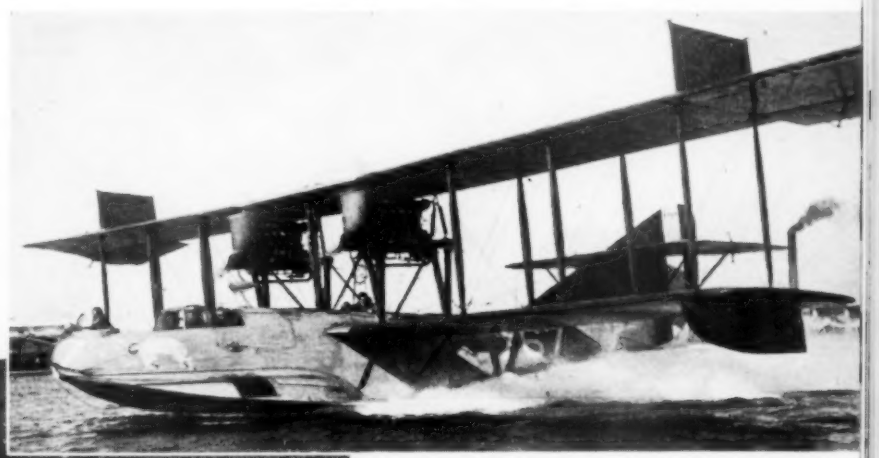
by J. B. HANCOCK

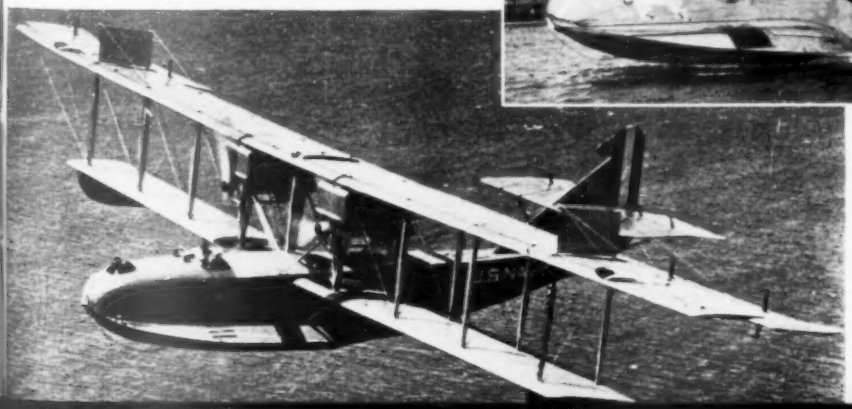
tion world seems to know little, but who worked untiringly to point out to all who would listen and observe—and even to those who would not listen—the future possibilities of aviation, not only with regard to its importance to national defense, but commercially.

The first successful hydro-airplane flight in this country was made by Glenn Curtiss on January 26, 1911, in a plane of his own manufacture. The Navy cooperated in the design and testing of this craft, which was mounted on a single pontoon and in addition had wingtip floats. On February 17, 1911, Curtiss flew this tractor plane from North Island, near San Diego, Cal., to the *U.S.S. Pennsylvania,* which was anchored in San Diego Bay, and was hoisted aboard by means of a boat crane. After this the plane was lowered over the side of the ship and flown back.

The Navy had had a convincing demonstration of the practicability of handling an airplane on board a ship, and realizing the many ways an airplane could assist the fighting forces, adopted the new craft two months later. Curtiss had been assisted in his demonstration by Lieut. T. G. Ellyson (the first naval officer to qualify as a pilot) and Mr. C. C. Witmer, a Curtiss pilot who later became a lieutenant in the Army Air Service. Lieutenant Ellyson, dressed in a bathing suit, climbed onto the pontoon of the plane, after it had been lowered from the ship to the water, to crank the engine for the return flight. The only retreat after cranking was to dive into the water and swim to the rowboat manned by Witmer. This he did, but when he was pulled aboard the rowboat it was discovered he had had a very narrow escape from death for on his hair was grease which had come from contact with the spinning propeller blade. Incidentally, one week later Lieutenant Ellyson became the first passenger to be carried in a hydroplane. Dressed in a bathing suit he clung to a position on the float just below and to the rear of the pilot. The flight was successfully accomplished although it had been all that Ellyson could do, wet and shaking with cold, to keep from being hurled clear of the plane during the flight and the landing in the water. The carrying of this extra weight below the plane itself gave birth to the idea that the then usual position of the pilot and motor between the wings could be lowered to the pontoon, and this Curtiss did and the first flying boat was born. The subsequent plane designed to incorporate this feature was known as Flying Boat No. 1 and was flown in January, 1911.

This flying boat had a 60 h.p. engine which turned two tractor propellers through a chain system. It was entirely successful and in cleaning up the design Flying Boat No. 2 was produced. In

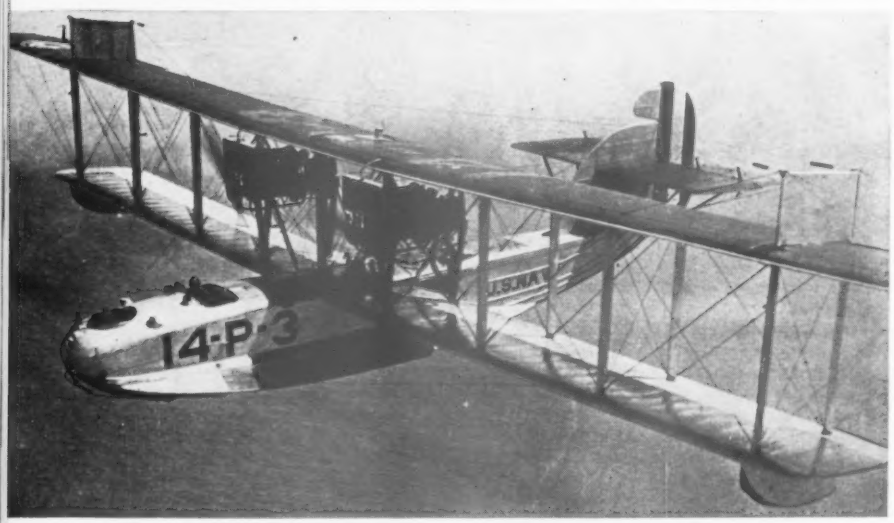




One of the first of the "big babies", the H-12 type flying boat (above) was produced in large numbers in 1917. Several of these boats served the Allies in Europe.

With the war going full blast in 1917, flying boats of all sizes were being built in this country. The H-16 (left) was just another, complete with wing "tennis court".

Most famous of the early Curtiss flying boats was the NC type. One of the first airplanes to cross the Atlantic was an NC boat (NC-4 shown above). Power was supplied by three Liberties.



The F-5-L boat (above) also was popular in 1917. Another historical Navy patrol boat was the PN-9 (below) in which Comdr. John Rodgers flew from 'Frisco to Hawaii in September, 1925.

this plane the engine with a pusher propeller, was placed between the wings, the pilot was placed in a cockpit near the bow and the hull was extended to carry the tail surfaces. The fundamental design used in these first flying boats is still followed by the highly successful flying boats of today.

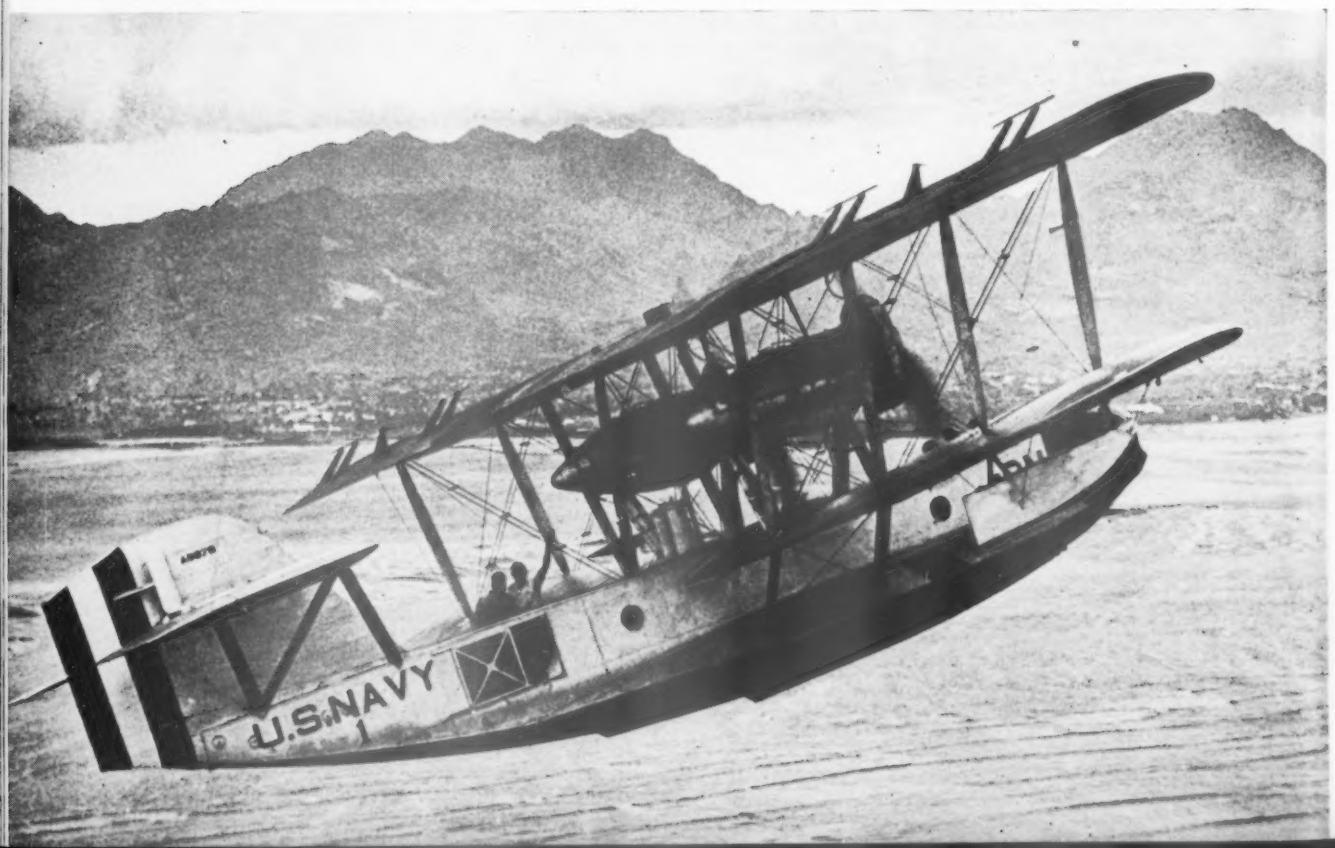
During 1913 the Navy conducted many experiments both with seaplanes and hydroplanes and the Wright brothers, Starling Burgess, Aeromarine, Martin, Standard and several others entered the flying boat and seaplane field of experimentation and production.

The next development of basic importance was the result of the desire to demonstrate the feasibility of a trans-Atlantic flight. A plane named *America* was constructed in 1914 by Glenn L. Curtiss. Capt. J. H. Towers (then a lieutenant) worked in close cooperation with him on this project. The World War prevented the carrying out of the proposed flight but its design served as a basis for later planes of the patrol type.

The *America* had a wing span of 72 feet, was equipped with OXX engines, and weighed about 5,500 pounds. Naval observers witnessed the trials and assisted in the modifications ultimately incorporated in the hull. These modifications were later employed in the F-5-L, H-16, HS and H-12 types.

From the *America* the British developed the deep Vee bottom although the U. S. Navy had tested such a design in floats in 1912 at San Diego. These English types became the prototypes of the H-16 and F-5-L used successfully by the U. S. Navy during the war.

Independent of the *America*, Curtiss



developed the H-12 and the HS hulls. This flying boat was produced in large quantities and many were engaged in the submarine patrol services in European waters. Following the war the HS's, H-16's, and F-5-L's were released to commercial interests and were placed in operation in the southern United States and in Caribbean waters, forming a background for the commercial aviation development which has taken place in that area.

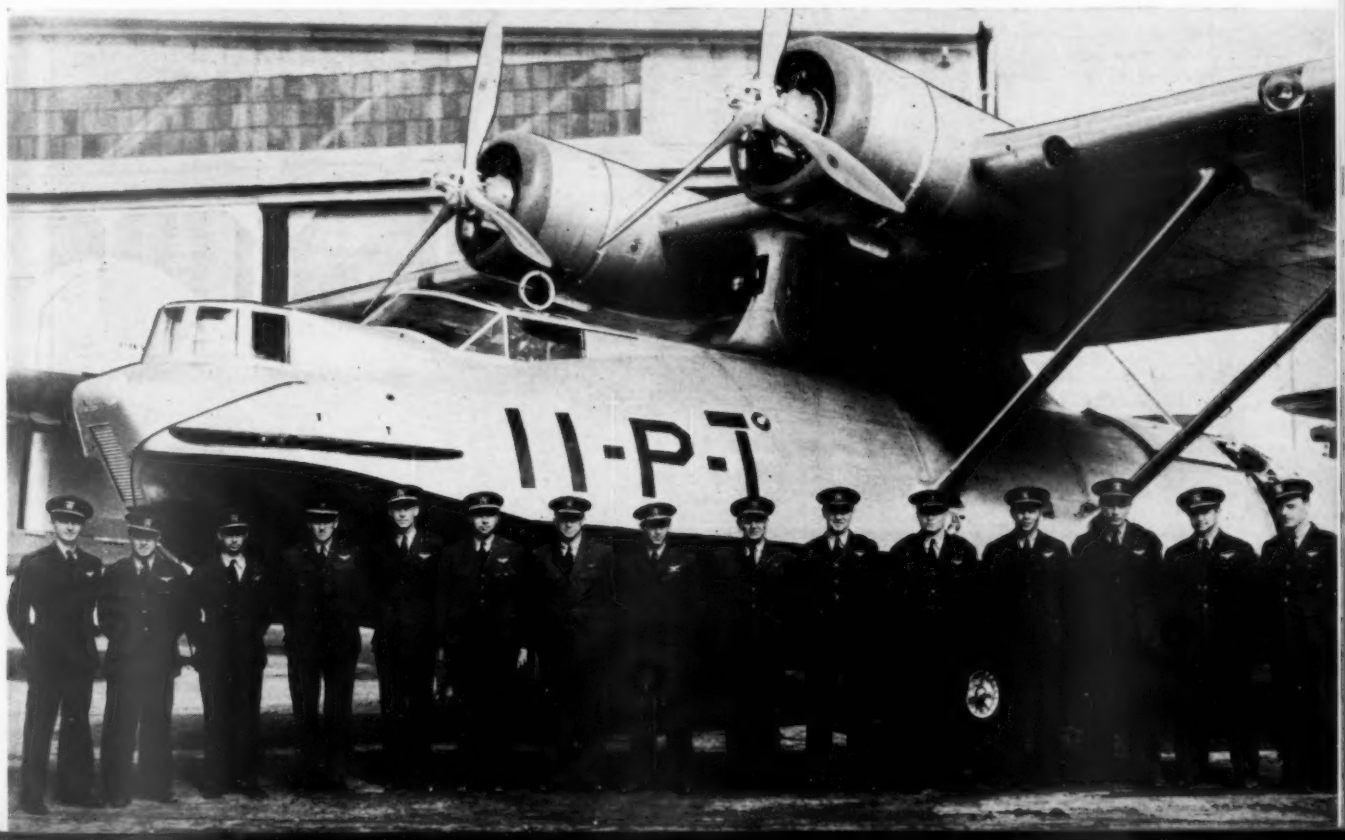
The H-16 was originally the so-called Felixstowe (English) design, and many were built prior to our entry into the World War. The British H-16 used two Rolls Royce engines of about 250 h.p. each while in the United States the plane was fitted with two Liberty engines. The maximum load of the plane was 10,900 pounds.

The F-5-L of the U. S. Navy was derived from the British F-5-A and was substantially an enlarged H-16 but produced greater range and ordnance load.

When the war ended, the Navy, which had always been particularly active in the development of the flying boat, was left with a vast amount of war aviation equipment, consisting almost entirely of flying boats which for economic reasons had to be utilized, and which curtailed greatly the building and development of newer and more advanced types in quantity. However, during the war the NC type, again a Navy-Curtiss project, had been developed for delivery by air to Europe and, although the war ended before this could be effected, completion was carried out and on the afternoon of May 16, 1919, the NC-1, NC-3 and NC-4 took off from Trepassey, Newfoundland, for Horta, a port in the Azores. Comdr.

The route between San Francisco and Honolulu became more and more commonplace with the advent of boats like Consolidated's P2Y-1 (above). Squadrons made the long ocean flight with ease.

Grandfather to the P2Y-1 and great-grandfather to the PBY-1 (below) was the PY-1 (above). The men in the lower picture recently ferried a squadron of PBY-1's from San Diego to Hawaii.



J. H. Towers commanded the flight of the NC's as well as the NC-3. Lt. Comdr. P. N. L. Bellinger commanded the NC-1 and Lt. Comdr. A. C. Read commanded the NC-4.

The saga of that memorable flight will long be remembered: how the NC-1 and NC-3 running into weather far different from the expected good weather, landed to obtain radio-compass positions and found the sea too rough to take off again; how the crew of the NC-1 was taken aboard a passing steamer; the *S. S. Iona;* how the NC-3 crew struggled through a heavy storm for two and a half days and finally were successful in sailing their battered plane to the island of San Miguel; and how the NC-4 flew through fog and rain and reached Horta in the Azores on the afternoon of May 17, after covering the 1,200 nautical miles in 15 hours and 18 minutes—an average speed of only a bit more than 78 knots and that due in part to a 15 knot tail wind.

After several delays due to fog and other unfavorable weather, the NC-4 reached her goal at Plymouth, England—the first flying boat ever to have flown across the Atlantic.

The NC hulls formed a definite advance in flying boat design with a 10-foot beam and designed to take off with 22,000 pounds. The hulls actually flew with more than 28,000 pound load in the trans-Atlantic flight. With a wing span of 126 feet, an overall length of hull of 45 feet, four Liberty engines of 400 h.p. each, and carrying a crew of six these planes were a marked forward step in flying boat development.

The experiences of the NC's in the first trans-Atlantic flight indicated that the hulls required more buoyancy at the stern. From model basin research a new set of lines was evolved known as design No. 71 and a "type design" was issued for a monoplane type flying boat utilizing these lines, essentially the NC lines of hull with an integral extension which carried the tail surfaces.

Based on competition, the Consolidated Aircraft Corporation was awarded a contract for planes using this type of hull but with a wing arrangement slightly different from that advertised in the type design. The structure of the hull was worked out in close cooperation with the Navy Department and the result was the PY type. This type formed the basis for the design used in the *Commodore* type—used in the Pan American service to South America.

In order to insure continued development of the flying type, the Navy, while using its wartime surplus, designed and built, at the Naval Aircraft Factory at Philadelphia, a series of big boats known familiarly as the PN type. To demonstrate the success of the design of this type, a flight of two planes from San Francisco to Honolulu got underway on August 31, 1925. The PN-9 was commanded by Comdr. John Rodgers and the PN-9 No. 3 by Lt. A. P. Snody. During the evening the latter was forced

(*Concluded on page 77*)

From P.A. to the Navy—With Regards

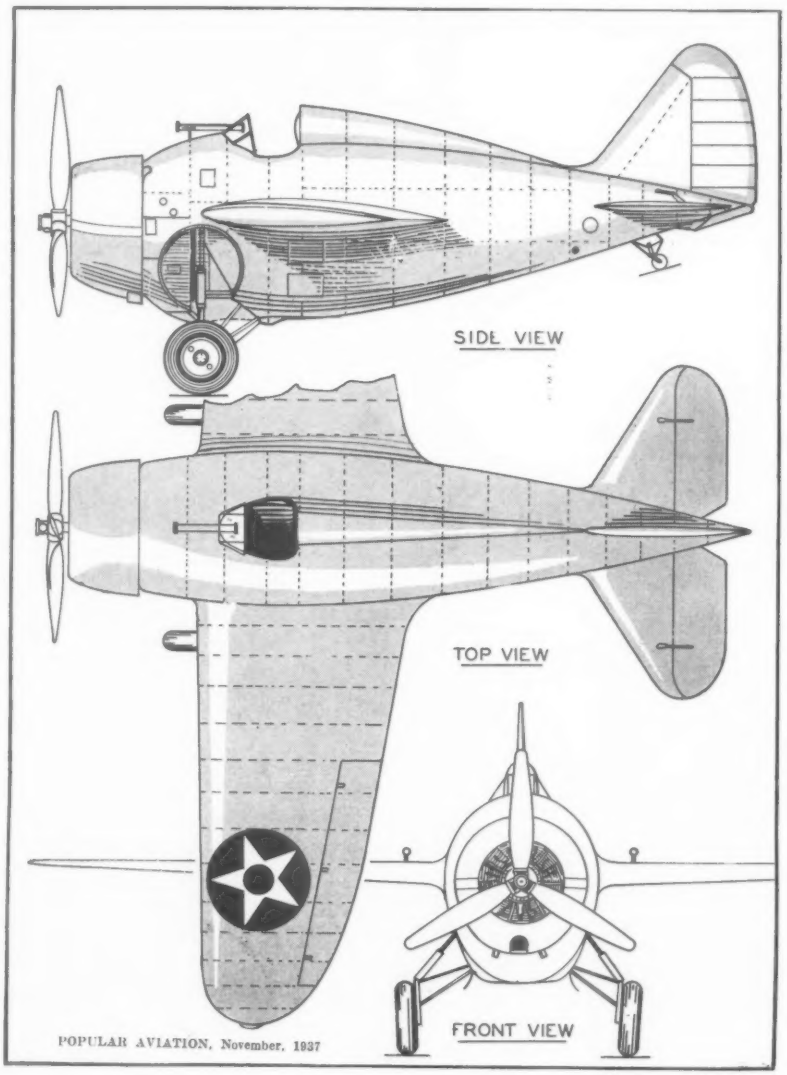
FOR quite some time POPULAR AVIATION has been the recipient of hundreds of "dream ships" from its readers. These imaginary designs for airplanes ranging from fast fighting planes to big transports have come to us from readers in every corner of the world. We've enjoyed them a great deal because of the new ideas they presented.

One good idea usually leads to another which, in this particular case, has resulted in POPULAR AVIATION turning the tables somewhat. In other words, we have a dream ship to offer.

Having a little breathing space one day recently, we first decided on donating a dream ship to the Navy. Then, looking back over the various fighters purchased by the admirals, we picked the likeliest standard design used by the Navy at present and concocted our own little dream ship. The results are drawn in the imaginative sketch below.

As can probably be seen, we have selected Mr. Grunman's fine basic design for our little aerial pipe-dream. With the help of our artist, we rigged up this trim midwinged monoplane, mainly because there seems to be a trend toward the midwing. By working that in with the present Grunman F3F-3 biplane fighter, we got the trim design shown below. The wing might be either cantilever or wire-braced, depending entirely upon what the admirals take a fancy to. The standard Grunman landing gear seems to have proved itself and is quite suitable for P.A.'s dream ship.

But, on looking over the drawing, we might even alter our little design a bit. The controls might be Frieze balanced as shown on our dream ship's elevators—or they might be left plain. For a Navy fighting ship, the wing probably could be a bit thicker. But all in all, we think it's nice enough for a little gift.



Old Days at Hempstead Plains

by CAPT. HUGH C. DOWNEY

There's an historical old piece of land near New York City today that fairly radiates romance of aviation's early days. Many a famous flyer found his wings here.

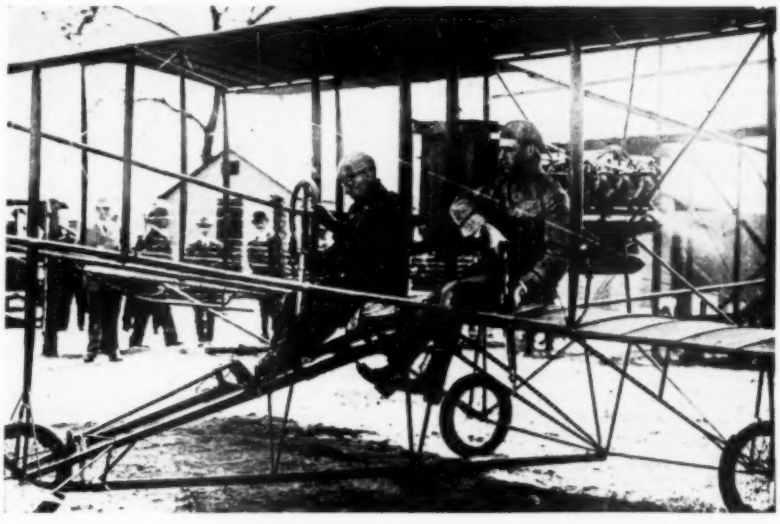
HEMPSTEAD PLAINS in 1913. Who remembers Hempstead Plains in 1913? This was back in the fabulous days when war was not dreamed of. Again, perhaps many do remember the Plains in those days but their memories are hazy.

There are a few of us though, who will never forget. Twenty-three years ago the Plains was an incubator for early flyers.

We got off the train at the old sprawling wooden railroad station at Mineola, Long Island. If we were prosperous, we hired a prewar vintage car or a horse and buggy and drove east along the Old Country Road for a mile or so, out across the flat open space that was then known as Hempstead Plains. If we were not prosperous—and we generally were not in those days—then we walked.

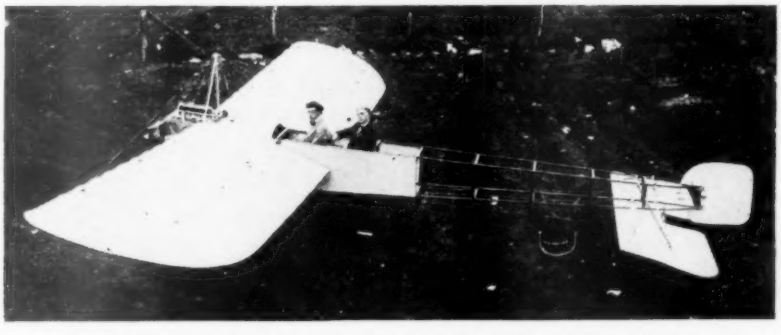
The Plain is still there but it has lost a great deal of its significance since the countryside has been cut up with roads and cross roads and thousands of small houses dot the landscape.

Before we leave the outskirts of Mineola and turn out on the Old Country Road, we pass the Gold Bug Inn. The Gold Bug Inn was romantic to us, for it was here that Glenn Curtiss lived and worked when trying for the Scientific American trophy in 1909 which was put up, with $1,000 in cash, for the first American aviator who would fly for more than one hour in public. You see the Wrights, who preceded Curtiss, had an inborn prejudice against doing anything in public at that time. When Glenn died he left Pete McLaughlin, owner of the Gold Bug, a piece of property in Miami. He never forgot Pete. Here many another early flyer had hobnobbed with the proprietor, Peter McLaughlin, while he downed his highball. Here it was that Bert Acosta sang "My Wild Irish Rose," for the edification of the boys while he nursed a creme de menthe. Here also were congregated engineers, reporters, scientists and aviation enthusiasts in general.



Charles F. Willard flew this early Curtiss pusher, fondly known as "The Banshee". His passenger was Lieut. (now Col.) J. E. Fickel who went along for target practice.

The late Lawrence Sperry shown seated at the wheel of an old Curtiss "tripod".



An American company built this version of the famed Bleriot monoplane in 1912. This ship is very similar to the ship that Bleriot himself flew across the English Channel.

It was all tremendously exciting but with all that there was a quaint but enduring atmosphere about the place that will always stay with us who saw and felt what happened on the Plains then. The spirit of Wilbur Wright, already dead, brooded over the place.

The Plains then stretched for miles with hardly a bump from the town of Hempstead which was then much smaller, north to tiny Mineola, east to little Westbury and west almost as far as Jamaica. This was ideal as a hopping ground for flyers excepting, of course, during the winter.

About a mile east of the Gold Bug Inn one perhaps heard a sharp buzz and if one watched closely perchance one caught a fleeting glimpse of something flashing in the sun. A plane was in flight for a moment, but just a moment.

We hurry and, after a time, arrive at the Aeronautical Society Field. On what is now Roosevelt Field there were three small steel and concrete hangars which are still standing on the side toward Clinton Avenue. There were also two or three old decrepit sheds or hangars although the term hangar had hardly come into use then.

On the Old Country Road side were several more ramshackle sheds. At one end of the hangars was a huge elm tree where Joe Seymour used to sleep in the sun. This early field was maintained more or less, by the Aeronautical Society, an organization of zealots devoted to fostering the new act of flying.

Above the doors of these hangars were painted in bold but somewhat worn let-

ters, names that in those days were names to conjure with.

Captain Baldwin,
Moissant,
Charles F. Willard,
Clifford B. Harmon,
Huntington Aircraft Co.
Gallaudet,
Bellanca,
Seymour,
C. O. Hadley,
Geo. Schmidt, etc.

A strange and motley lot were they, but even more so were the contents of these hangars.

Captain Baldwin was a big bluff hearty fellow who had done many years of ballooning and parachute jumping before taking up the airplane. He maintained a troupe of exhibition flyers among whom were Bud Mars, Cecil Peoli and Tod Schriver.

Indeed, the one source of revenue that kept all these adventurous souls going in those days was exhibition flying. Aviation was new and sensational and these hardy souls often received as much as $1,000 a flight, in the hinterland.

But, also, accidents were frequent and engines and planes very balky so that the occasions were somewhat rare when aviators and cash connected. Furthermore, if one had the yen to engage in this romantic but hazardous business there practically was but one alternative. That was to build your own plane. Nearly all the people mentioned built their own ships.

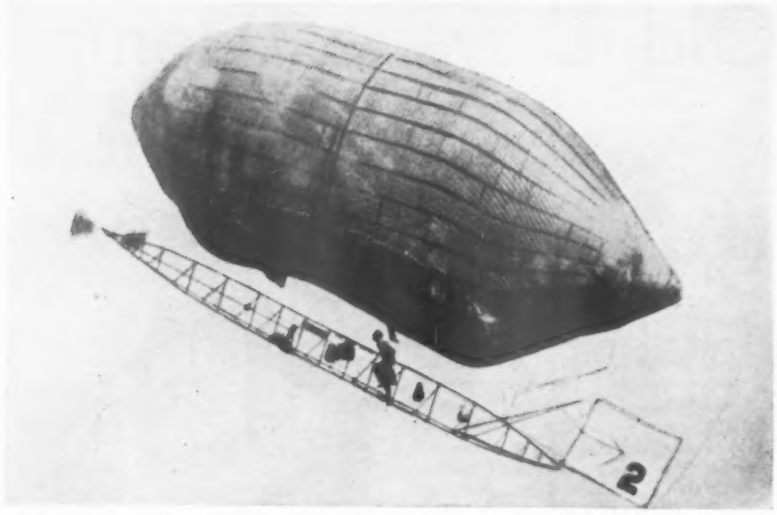
Captain Baldwin had several of his Red Devil biplanes, as he called them. These were a cross between the early Curtiss pusher and the early French Farman biplane and, believe it or not, they had a structure of steel tubing even at that early date. He always covered the wings with rubberized bright red fabric for, you see, Captain Baldwin was and old showman and he knew how to get attention from the crowd.

His exhibition team was featured all over the country, even in Japan, with large vivid posters, telling in letters a foot high of the exploits by his daring pilots and their Red Devil biplanes.

Probably the most glamorous of the lot were the Moissants. They differed from the general run in one startling respect. They had plenty of money. They hailed from South America where they had large sugar interests. John B. Moissant was the leading light and his brother Alfred the business manager. They also had a fascinating sister, Mathilde, who learned to fly well.

The planes they used were Bleriot copies. John B. had learned to fly in France at the Bleriot school and brought a Bleriot monoplane back with him which they used as a model to construct others, using the famous French Gnome rotary engines for propulsion. They owned the steel and concrete hangars. John B. was well known in those days for his exploits, one of which was a sensational flight from Paris to London. He also made many other exhibition flights in Europe and the United States.

But the male folks were far more interested when the stunning Mathilde got togged out in her flying outfit from Paris and took off in her Bleriot for a hop. The only trouble was that when she came down her nice white suit was covered with castor oil. That wasn't so good from Mathilde's point of view.



Big part of Captain Baldwin's entertainment was supplied by his airships like that above. The pilot had to run back and forth on that catwalk to keep the ship on an even keel.

Their most unique asset, however, was Joe, the French Gnome motor mechanic who couldn't speak a word of English but could swear beautifully in French for hours on end.

There was another attractive lady flyer who used a Bleriot monoplane too, in those days, Miss Harriett Quimby who also learned to fly in France at the Bleriot school. She was assistant editor of *Leslie's Weekly* which is now defunct.

Miss Quimby, after making many able flights, was killed at an aviation meet in Squantum near Boston where she was making an exhibition flight. With her, the father of Charles F. Willard also perished.

Charles Willard was a peppery little blonde haired fellow, chuck full of energy who previously had been a member of the famous Curtiss exhibition team, composed at one time or another of Eugene Ely, Willard, Mars, Hamilton, Lincoln Beachy, and others. He was the exact antithesis of Tom Baldwin. In one respect he was superior to most of these men in that he was an able trained engineer.

Here and later on Willard designed and built many airplanes with advanced features and performance. He was for a time chief engineer of the Curtiss Aeroplane and Motor Corporation.

Willard was one of the first pilots in the world to take aloft more than one passenger, a feat he performed here in a plane of his own design and construction. Later on he designed and built many planes for the United States Army and Navy among them the Aeromarine Naval training plane and the L. W. F. Army biplane, all used during the war.

Then there was Joe Seymour who had been an automobile race driver. He had a cute little Curtiss copy with a four cylinder Curtiss engine. This plane Joe would fly day after day about 20 feet above the ground, but never a turn would he make, for Joe was a big heavy fellow and the little four cylinder engine, with its 40 horsepower, couldn't take it on a turn. It would sideslip to the ground and crack up. Then Joe had to go to work and patch it up again.

On this particular airplane many another fledgling, including Cliff Hadley, learned to fly. This little plane, although low powered, was the most reliable and faithful little servant on the field. It seemed always ready to run and quite content to keep running except, of course, when cracked up. Furthermore it was economical which was quite an item for the boys then. It was a handy little craft but of minute proportions compared to some of the giants of today.

The Heinrichs were interesting fellows. They hailed from Baldwin, L. I. There were two brothers. Incidently brothers seemed to be an effective setup in early aviation. We had the Wright brothers, the Gallaudet brothers, the Heinrichs brothers, the Boland brothers and several other family pairs. These brothers were both of medium built but surprisingly alert and, from an aerodynamical viewpoint, their planes showed advanced design for those days. The workmanship was excellent too. George Page now an engineer of the Curtiss company, and several others, learned to fly on these monoplanes.

Ah yes, those were the halcyon days. And there was Topsy Sherwood and the time he flew over the Hackensack meadows and ran out of gas in his homemade plane, the time Earl Ovington carried the mail and the time Cliff Hadley flew off the ice at Tarrytown just to show the hometown folks he really could fly, and Doc Green with his flying machine. But I'm getting ahead of myself.

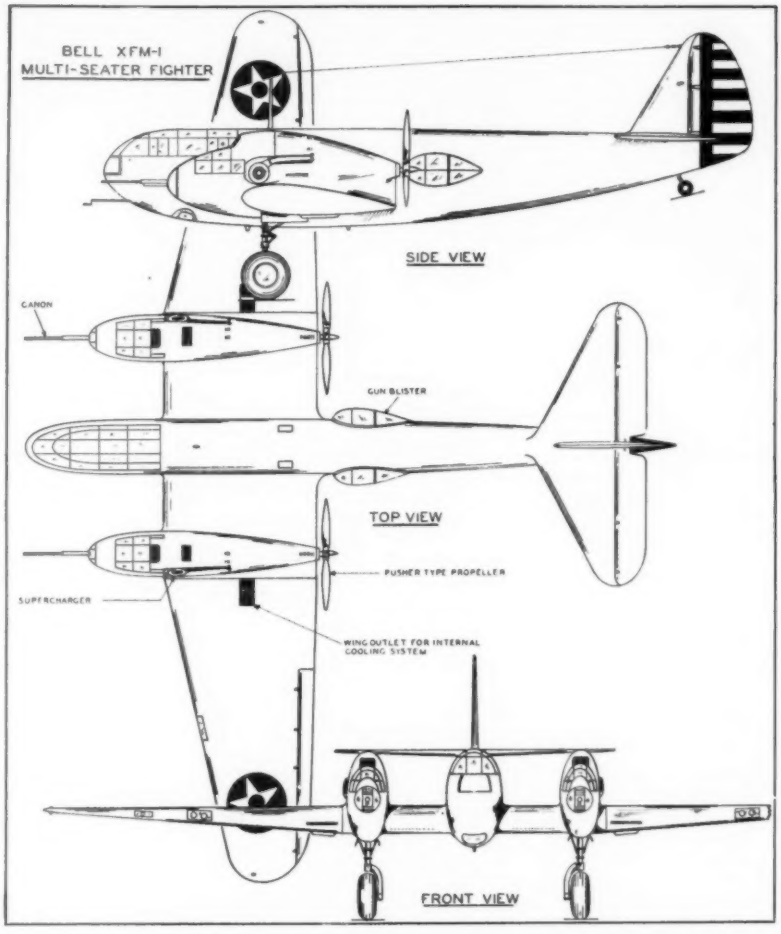
Where are all these heroes of yester-

(*Continued on page 72*)

The New

BELL XFM-1 FIGHTER

Great things are claimed and planned for this new Army Air Corps battleplane, now undergoing tests.



ARMY Air Corps engineers did so well with their latest bombers (Boeing "Flying Fortresses") that they became worried over their own success. The new bombers turned out to be so invulnerable to the attack of present-day pursuit ships that Air Corps strategists apparently began to wonder just how Americans could stave off the attack of enemy bombers as potent as the Boeings. The Bell XFM-1 (Experimental Fighter Multi-seat, Model No. 1) is the first attempt to answer that question.

The new plane is a radical departure from conventional military design. Powered with 1,000 h.p. Allison engines (they are pushers), the Bell fighter carries a crew of five: pilot, co-pilot, radio operator-gunner and two outboard wing gunners. Literally, the ship is to air forces what the destroyer is to the Navy. Six guns (four machine guns and two cannon) as well as a load of light bombs are carried by the new ship, making it one of the deadliest airplanes a-wing.

All gasoline is carried in wing tanks. The ship is all metal, flap-equipped and has electrically retractable landing gear and tail wheel. Because of its fighting ceiling (30,000 feet) the ship is equipped with heated compartments for the crew.

Most novel feature is the pusher arrangement. This system, with the added advantage of electrically controlled propellers, gives the ship extremely high performance. Also, each member of the crew can change places in flight. There also is telephone communication between all members of the crew. An auxiliary power plant is another feature. This drives nine electric motors which operate the ship's electrical equipment.

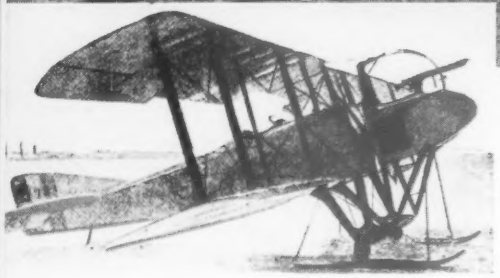
The XFM-1 is now at Wright Field.

Bechereau and His Spads;

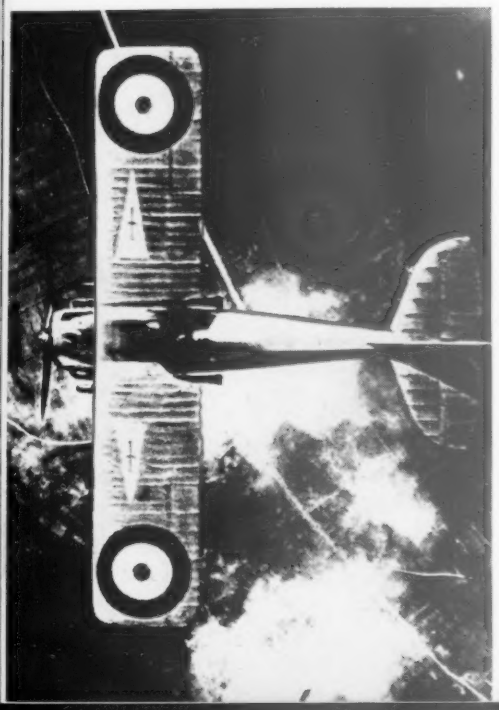
Here is the story behind the birth of the famous Spad.

by ROBERT C. HARE

This is the most famous Spad in aviation history: the Model 13-C1. It was in this Spad that the War's air aces achieved their everlasting fame.



First Spad ever built was the S-1 (insert above) which was used on skis by the Russians. The front cockpit on this ship was hinged. Note the early machine gun. The Spad 7C-1 below was photographed during the World War from another ship that accompanied it over the Front. This machine belonged to a French pursuit squadron.



ONE sunny morning in June, 1915, a group of four men stood in front of a hangar at Bleriot airdrome, located outside of Paris, discussing an odd looking biplane that stood nearby.

Each of these men was a specialist in his field; Colonel Dorand, head of the French Air Service engineering department; Marc Birkight, the Swiss automotive genius, who was at that time developing the Hispano-Suiza engine, and M. Bechereau, designer of the queer biplane.

Young Bechereau, baby of the quartet, had been, only five years before, a student in a Paris engineering school. His rise had been phenomenal, his skill in aeronautical engineering unusual, yet his products always will bear the names of others.

In 1911, Bechereau had approached Armand Deperdussin, Lyon silk merchant, who was desirous of sinking his fortune in aviation, with a racing monoplane design which other constructors had regarded as impractical.

But Deperdussin, as farsighted as he was dishonest—he was later jailed on swindling charges—promptly took Bechereau under his wing, built the racing plane at his private airdrome, and entered it in the 1912 Gordon Bennett Cup race. The world was amazed when this sleek monoplane, piloted by Jules Vedrines, won the event with an average speed of 107.4 m.p.h.

Deperdussin became a familiar name in aviation circles. Improvements were made in the 1912 design, and on September 21, 1913, at Rheims, Maurice Prevost won the Bennett with an average speed of 124.5 m.p.h. over the 200 kilometer course. These monoplanes were the first aircraft ever to exceed a speed of 125 m.p.h.

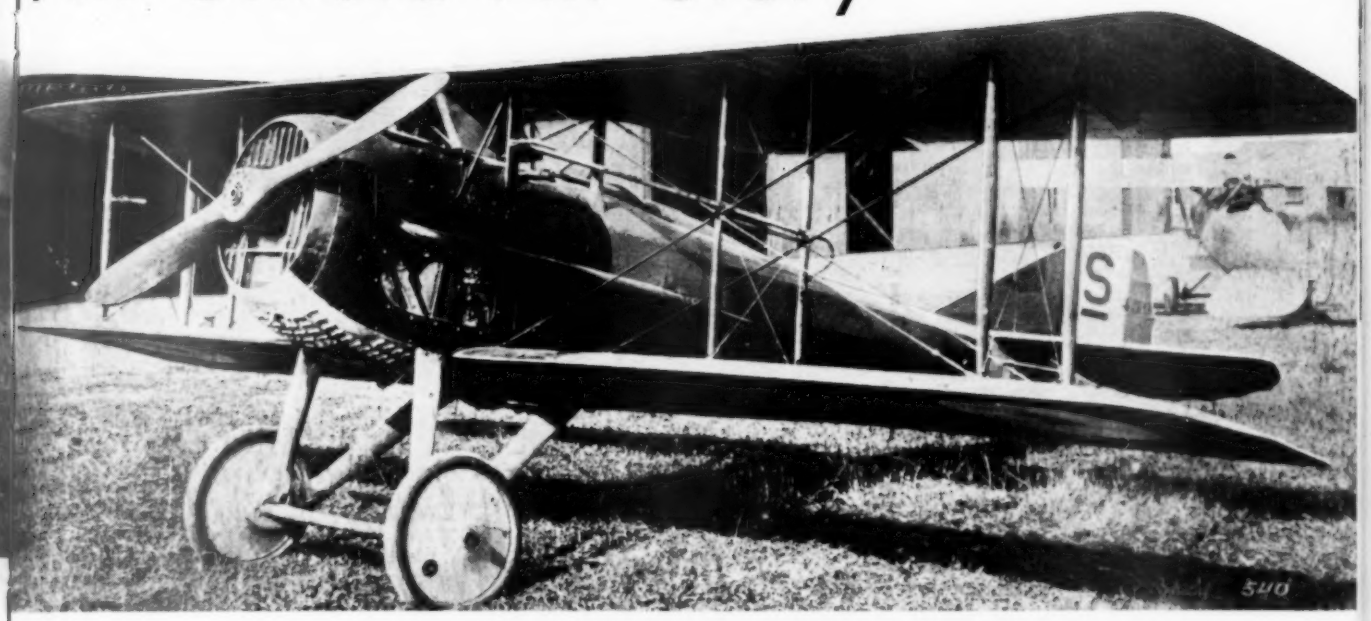
Bechereau continued to design for Deperdussin until August, 1914, when the Societe Pour les Appareilles Deperdussin became defunct. Louis Bleriot, however, in order to preserve the engineering talent of the firm and that of Bechereau in particular, took over the grounds and sheds to form the familiar Societe Pour Aviation et Derives. New conditions of this arrangement provided an opportunity for Bechereau to study under old masters and to learn from experience fine points in design which his theoretical study failed to provide.

Concurrent with organization of the new S.P.A.D. firm, war was declared, a war that was to make the airplane a practical weapon and, most important, a safe means of rapid transportation. Rapid development, such as occurred during those four years, was necessarily dependent on the work of progressives. Bechereau had proven himself such a type for Papa Bleriot encouraged him.

With a free hand to develop his designs, Bechereau produced the S.P.A.D. S-1, that strange biplane, in answer to France's call for a fast two-seater fighter. In its design he had produced a tractor type of airplane with an unobstructed front field of fire for the observer.

The S-1 had a wingspan of about 37 feet, length of about 24 feet and was powered by an 80 hp. Le Rhone rotary motor. At sea level, the S-1 had a top speed of 86 m.p.h. and its ceiling of 14,000 feet made it one of the best machines of its time. Unfortunately, its use was limited to the Russian forces

An Untold Air Story



Tried but not too true, the Spad 12 Ca-1 shown above was the first of the "cannon planes" that are becoming popular today. The gun fired through the propeller. Pilots, however, disliked it.

because France had under contract more Farman and Voisin machines than she could use in their limited capacities.

The S-1 was equipped with skiis in Russia, and the observer's seat was fastened to a set of hinged struts which, when let down, allowed access to the motor.

While the S-1 was plying Russian air, Bechereau was busy at his drawing board planning a small fast single-seater pursuit machine which would give France a much needed edge on the Fokker monoplanes which then held supremacy of the air on the Western Front. A demand for this type of ship, hitherto thought a sportsman's luxury, was made eminent by the introduction of Fokker's synchronizing gear.

S.P.A.D. types S-2 to S-6, inclusive, never left the drawing board stage, but each design contributed to one of the finest little ships ever built—the S-7.

The S.P.A.D. S-7 was made possible only through the development of the Hispano-Suiza motor, designed by Marc Birkight, who worked closely with Bechereau on this project. A glance at the photos will show that the engine and plane were more or less constructed as an integral unit.

It was in July, 1916, that the first S-7 stood on the Bleriot field awaiting its tests. Its new 140 h.p. Hispano motor ticked merrily as the pilot checked pressure and r.p.m. To one side, a group of four men stood loudly discussing the ship over blasts of its motor; the same four men who, a year before, had approved the S-1.

Bechereau was at the same time experiencing brain races common to every designer-engineer before his new creation takes the air for the first time. Had his calculations been correct? Would the light construction be strong enough to withstand vibrations of 140 compact horsepower? Were the weights so distributed that combat maneuvers would not throw disastrous strains on supporting surfaces?

Anxiously, Bechereau watched the S-7 taxi to one end of the field, turn into the wind, run past with its tail in the air, lift and climb rapidly into the blue. A minute later, at 1,000 feet, the S-7 sped over the group, circled the field and landed.

Bechereau was elated; his machine flew fast and well! The ship was immediately flown to Villacoublay, site of the French governmental aircraft testing and engineering station, to be examined and approved.

Military aerodynamists were amazed at the simplicity of the S-7's design. The fuselage was built of four main longerons and uprights of spruce held together by steel fittings bolted to the frame. The lower longerons in front were enlarged by spruce laminations in order to provide anchorage for lower wing fittings, and a foundation upon which motor bearers were built. Control levers as well were fixed to this lamination.

The S-7 fuselage was well streamlined through use of a circular front end which was maintained in effect to the rear. Sides were only slightly curved to provide an unrestricted downward view for the pilot.

Aluminum sheet was used exclusively to cover the forward portion of the fuselage to the vicinity of the cockpit. The rear two-thirds were covered with cloth in a conventional manner except for the plywood base coming immedi-

Not all Spads were pursuit ships. Many Spad observation ships saw World War service. An unpopular Spad was the 11A-2 shown at the right. However, when this model was redesigned it became the popular Model 16A-2 and was also redesigned as a fighter-observer. The 16A-2 had four guns.

ately behind the pilot's seat. The rounded nose carried a circular radiator behind which a Hispano-Suiza 140 h.p. motor was mounted. Projecting cylinder banks were covered by streamlined helmets, perforated to aid in cooling.

Most unusual, however, was the S-7 wing structure. The cellule, on first examination, appeared to be of a massive two-bay type, but in reality was a simple single-bay affair with eight demi-struts to distribute the loadings more evenly over the spars. From the photographs here it can be seen that the outer struts were conventional, but that the inner struts are divided in the middle and connected by a crosspiece, at which point the rigging wires intersected.

Ailerons, fitted in the upper wing only, were actuated by an aileron strut connected to a rigid quadrant attached to the rear spar and rear strut of the lower wing. This quadrant in turn was hinged to a tube running through the lower wing, the whole assembly operated by rocking the control column laterally.

A conventional vee type landing-gear of streamlined spruce featured one of the earliest forms of split axle, that is, an axle hinged in the center of the spreader bar to allow play in taking up landing shocks. Rubber cord was used for shock absorbing, according to the practice of that time.

Aerodynamic efficiency was Bechereau's primary aim in designing the Spad S-7, and its performance will bear out his achievement in this direction. At sea level, the S-7 had a top speed of 123.5 m.p.h. and climbed to 6,500 feet in 5 min. and 50 sec. Its service ceiling, unusual for those days, was 15,000 feet at which point the rate of climb dropped below 100 f.p.m.

And how did the S-7 fly? Here it might be said that wartime planes had so many characteristics of their own that it took a first-class flyer to learn to overcome the bugs of even one type of machine. Accordingly, pilots who became used to one machine in a scrap, knew its limitations and tendencies under combat conditions, found it difficult to fly another type as well. In other words, a good Camel pilot was sometimes a washout on Spads and vice versa.

Some pilots could make a Spad turn on a dime, while others actually skidded to "blighty". Even under skilled pilotage, the S-7 had to be flown at all times; it probably had less inherent stability than any other war machine; but it was not hard to control because of its sensitivity.

On taking off, an S-7 pilot had to hold the stick forward considerably longer than in other types to get the heavy tail off the ground. By that time she was ready to lift and fairly leaped into the air. Once off, the S-7 rode like a broncho.

When patrol was finished, an S-7 pilot had to fly home, fly over the field and almost *fly* to a landing. The S-7 had, as one wartime pilot told the writer, "the gliding angle of a streamlined brick." Once over the tarmac, she would drop immediately when stalling speed was reached without "mushing", and pull up to a stop in about 100 yards.

A typical Deperdussin, designed by Bechereau, flying around the pylons at Chicago in the 1914 Gordon Bennett Races. Note the streamline body and the motor cowls.

The original S-7 accepted by the French, and subsequently sent to the Front in July, 1916, was equipped with the Hispano-Suiza 8A motor of 140 h.p. and had a total wing area of 192 sq. ft.

But Marc Birkight came forth with his new motor, the H-S type 8Aa, which delivered 175 h.p. Accordingly, the Spad S-7 was redesigned, and appeared in late 1916 with wing area increased to 195 sq. ft. This model was actually a mile an hour slower than the original, climbed more slowly, but had greater speed at high altitudes, and had a higher ceiling. Its landing speed was at the same time reduced from 59.5 to 56.5 m.p.h.

The third model of the S-7, which appeared in the summer of 1917, carried a Hispano-Suiza 8Ab motor which delivered 205 h.p. at sea level and boosted the speed to 135.5 m.p.h. and carried the S-7 to 16,400 feet in about 10 minutes' less time than the second model. Through refinement, the landing speed was further lowered to an even 56 m.p.h.

So great a success was the Spad S-7 that more than 5,000 of this type were built by France for her own forces and for those of foreign countries. This number does not include great numbers built in England through a licensing agreement for the R.A.F. and R.F.C. forces.

Bechereau's calculations had been correct. He designed probably the strongest plane of the War. As far as the writer knows, there is no record of a properly rigged undamaged Spad shedding its wings in the air. Spads have been dived so violently and pulled out so rapidly that the interior strut and wire fittings have actually pressed into the wood spars to the extent that, on landing, the wings drooped!

Young Bechereau was not content with this success, however. He had designed a trim little two-seater which looked well on paper, but was not considered practical to build. This design, the S-8, was rehashed and worked over through two more design stages until, in September, 1916, it blossomed forth under the serial number S-11.

In this model, Bechereau endeavored to apply all lessons of design learned from experiences with his single-seaters. In general appearance, the S-11 was therefore typically Spad. Its fuselage was of the same construction and outline as its predecessor, but proportionately larger. In addition to the pilot's seat, a second pit for the observer was fitted in the middle of the fuselage.

S-11's power plant was a Hispano-Suiza 8Bc 235 h.p. geared engine, which at this time was considered a daring experiment inasmuch as the motor was "souped up" from the original 175 h.p. type.

The wing structure, however, was of conventional two-bay design rigged like any other biplane of its day. Ailerons, carried in the upper wing only were operated by the quadrant-strut arrangement so successful in the S-7. Both wings were swept back, giving the machine somewhat racy lines.

Much has been written about the Spad two-seater's disfavor and inefficiency in service. It is true that, when a delicately balanced airplane is improperly loaded by accouterments which were not provided for in its original design, trouble will result.

The Spad S-11 was definitely a sensitive airplane. Properly loaded with its camera, wireless and observing equipment, it was easy to fly, handled well, was as maneuverable as could be expected at the time and could be counted on to bring home the bacon. A high

(*Continued on page* 78)

"....Clear and Unlimited"

by SWANEE TAYLOR

Does Pan American want to get out of the trans-Atlantic business? Are you interested in a revolutionary new safety-plane? These matters interest our commentator.

Atlantic Backdown? . . .

Everywhere you go nowadays the rumor persists that our valiant, imperial Pan-American Airways monopoly would give a sweet cookie to get out gracefully from their projected, and screamingly publicized trans-Atlantic service. President Trippe, I'm told, is the only one in the company, down to the last office-boy, who wants to go through with the deal.

Well, for one thing, on all the survey (not stunt) flights so far conducted, the British have showed up Imp. Pan-Am. to be the tipy-toey outfit they have always been. You know, tip-toeing up and down the Americas in fair weather only, to the tune of $2.00 per mile flown.

Another thing, with competition rearing its ugly head our people in Washington have intimated that it might be cheaper and better for the overseas mail to be flown on a poundage basis. And this, quite possibly, might be more distasteful to Imp. Pan-Am. than having our noiseless British cousins make them look like a feeder-line running through Arkansas.

Mind you, I'm merely reporting what is currently in the wind; just an honest journeyman commentator on the tides and trends of the times. Yet you may find substantiation to the rumors that all's not well over the Atlantic in the fact that Imp. Pan-Am.'s dexterous "Chief of Diplomatic Relations" has set up shop in Washington. Also, you are left to ponder over this fruity moral: Diplomatic fixing, like sweet Charity, may begin at home!

Bed-ridden Birdman . . .

That there is such a thing as poetic justice is further evidenced by the fact that Maj. Al Williams lies, at the moment, flat on his back on a cot in New York's Hospital For The Ruptured And. Crippled. (Some name, eh kid?) He's there because he was tossed out of a swaying Pullman berth and landed on one knee-cap with his flaps up.

I don't want to seem smug, but the poetic justice comes out inasmuch as the painful accident occurred on the same day when a Pullman Company magazine ad appeared on the newsstands proclaiming that "regardless of weather you get there in a Pullman." Unmistakably a slam at air travel.

Of course the advertisement wasn't sporting enough to say that you get there eventually and generally with a severe cold in your head—and sometimes a banged knee-cap. Which may be the very reason why the Omnipotent stepped in and selected Al Williams to serve as martyr for the cause of aeronautics.

Swanee Taylor

One thing is certain, the nation-wide newspaper and radio publicity did a lot to counteract the hoped-for advertising effect. Folks read the ad and, I'm sure, laughed a great deal. Good old sleeping car; unhealthily chilled, rocking, lurching and trying every foot of the way to jump off the track!

(Aside to the Pullman Co.: we've sorta got you worried, eh, pals? Never mind, though; in another ten years you can begin to convert them all to air-cooled cattle cars. Anyway, thanks for the recognition—left-handed though it be. Knock us some more, won't you please?)

Flight Critique . . .

Thanks to a rare combination of broadmindedness, tolerance and great daring, your devoted correspondent had the privilege of flying the new Gwinn *Aircar* all by hisself. Yessir, Joe Gwinn, the proud papa, Ray Quick, Frank Hawks, Harry Bruno and Nancy Love emerged from a huddle, on Buffalo Municipal Airport, to announce that I was to be the fifth person ever to sit at the controls of their little sweetheart in flight.

The reason why their decision amounts to great daring is because the Gwinn *Aircar* is not equipped with dual controls. This because Joe Gwinn holds to the opinion that as long as we need duals aviation hasn't arrived in a true sense. A point, incidentally, with which I can't fully agree. However, we won't squabble over that, my feeling being that duals in an automobile today might be a comfortable help.

You steady customers already know of my enthusiasm for every sound advance in the technology of flight, particularly how completely sold I am on the tricycle landing gear idea. And knowing this you will understand the difficulties I encounter in trying to keep what is supposed to be a level-headed analysis from becoming a hymn of praise. So pardon me if I bubble a bit.

There are, of course, the usual amount of "bugs" in the Gwinn *Aircar* that you find in any new type of anything. Yet these particular termites are of a harmless variety and have already been exterminated in the forthcoming production model. And, who knows, Joe Gwinn might even install a swinging control column, he's that open-minded.

The interior of the little side-by-side two seater conforms closely to what two generations of automobilists have grown accustomed to, including a radio set to follow the ball games and a foot accelerator. Frontal visibility is identical to what you see out ahead when seated behind the wheel of the old family flivver. While rear-view mirrors, set cunningly in the lower corners of the side windows, give you a chance to see if all is well astern.

Early models will be powered with English Pobjoy engines, either the Niagara II, or V, according to whether you want 120 or 137 m.p.h., top speed. No doubt, however, the advent of the *Aircar* will spur American light engine manufacturers to rise and meet the increasing demand for a motor suited to the needs of private, personalized flying.

Control of the Gwinn ship is centered in the steering wheel. Which is to say that she is completely rudderless; you just stick her up on a wing and she waltzes right around the corner. Although, happy to say, there is a directional "trimming" tab on the dashboard which enables one to make a much "cleaner" turn. This feature will appeal mostly to pilots who get squeamish whenever a ship side-slips the tiniest bit.

As said before, the Gwinn *Aircar* has top speeds of 120 and 137 m.p.h. depending on the motor. She cruises at 123 and 109 m.p.h., at 3,000 r.p.m. with flying ranges in excess of 400 miles. She is light (1,600 lbs. gross weight) but has a useful load of 550 lbs. including 45 lbs. baggage allowance. Her elevators are blocked to prevent the nose from dropping more than 20-30 degrees below the

(*Continued on page 62*)

THIS Bombing BUSINESS

There's more to these new bombers of ours than four engines and a wing.

SOON after the Army Air Corps' four-engined B-17 Boeing bombers were seen in the air, rumors of a still "bigger and better" bomber were rife in aeronautical circles.

These rumors proved neither fantastic nor long enduring, for soon after the delivery of the third B-17 to Langley Field an official news release featured the new super XB-15 (this in turn dwarfed by several commercial articles built for the trans-Atlantic trade).

To their new owners, these aerial skyscrapers are not just "some new ships". To the mechanics, pilots, strategists and commanders of the Air Corps they present problems both expected and unexpected, but problems which must be successfully solved if full value is to be gotten from the investment in them.

Let's first consider the problems presented by the "McFearfuls" in their reaction toward the big bombers. These people are part of the great public who look with childish pleasure toward anything new and startling, especially in aeronautics. Then, if a slight setback occurs in the orderly progress of a highly scientific venture and the mass mind dismisses the idea as lousy and immediately and shallowly turns to rapt contemplation of a press-agented movie stunt, murder headlines or political demagogy.

The McFearfuls, however, go still further in taking an actively hostile interest in the new idea. Like the hillbilly who saw his first airplane, "It'll never fly," said he. But it did fly. "Wa-al, anyhow it'll never git down," he gloomed.

Newspaper headlines and reporters' wisecracks were written just for this McFearful clan when the second B-17 nosed over at the test field. "Too much airplane for one pilot to fly" was a caption to one photo of the nosed-over bomber. And a million McF's. repeated this gleefully as more or less their own original *bon mot*.

The truth is that one pilot does not fly these large planes, especially not at the take-off or landing. With a combat crew of nine men, each man has his definite part to play in the preliminaries to and during flight and landing. That was the pilot problem presented by the big planes.

A ritual of precaution was evolved with the delivery of the first service article, and succeeding ferrying crews flying from the Seattle factory to Langley Field made necessary additions to this ritual or procedure until the present and highly satisfactory one is standard for this particular design of airplane.

The combat crew of the B-17 numbers nine; four officers and five enlisted men. All nine are expert aerial gunners. All four officers are qualified B-17 pilots.

1. Airplane Commander—First Pilot.
2. Engineer Officer—Co-pilot.
3. Meteorologist and Communications Officer—Navigator.
4. Armament Officer—Bombardier.
5. Master Mechanic—Crew Chief.
6. Assistant M. M.
7. Chief Radioman and Electrician.
8. Assistant Radioman and Electrician.
9. Chief Armorer and Ordnance Man.

Each flying crew member is responsible for the functioning of some part of the airplane or the condition of the take-off area and the surrounding air before each take-off. The reports of the mechanical staff come to the co-pilot who is engineer officer. He initials the check sheet, nods "O. K." to the first pilot and the latter after his own inspection, gives her the gun.

His eyes are both on the ground and air ahead. In his earphones he hears the voice of the co-pilot seated alongside of him. The co-pilot is reading off the manifold pressures. When the pressures reach the safe maximum the pilot checks the throttles and continues the climb toward the safety of altitude.

Soon after cruising altitude is attained the A. C. may give permission to throw in the gyropilot. One officer is then detailed to stand pilot watch, to adjust the gyro's controls, check landmarks, course, time, altitude and air speed. A mechanic may assist him by keeping tabs on engine instruments. The navigator and a radioman are also on watch.

On landing the co-pilot again takes up the interphone mike. This time he sets the flaps, sets and maintains r.p.m.'s and reads off the flying speed and altitude to the pilot at the controls. This assists the pilot in checking up on his own judgment as to altitude and airspeed.

The big bomber, while too much ship for one man to handle, is actually handled pretty well by the normal combat crew's combined efforts. Each man knows his job or learns it adequately

It even took a little figuring to get the most out of the Army's standard Martin B-10 (left). But the new Flying Fortresses present even greater problems to solve.

By T-2003

under the tutelage of a more experienced air man. A fire drill is also part of their training.

Even so, an unfortunate mishap might occur; some unforseen situation for which the airplane was not designed or for which the A. C. was not prepared might make headlines.

With the tribe of McF's lustily moaning aloud, and the newspaper editorial writers miraculously converting themselves from experts on economics and medicine to leaders in the realm of military aeronautics, there might be Congressional action militating against one of the biggest ideas in the last decade of national defense.

Air Corps leaders, well aware of the public's reaction and its possible results, of the tremendous possibilities of these super-bombers, of their consequent responsibilities; have done a fine job in selecting the personnel to man these giant planes.

The squadron commanders of the units using these ships, the airplane commanders, other members of the crews, are about the best in the Air Corps. This is not alone the writer's impression, it is confirmed by the officers and enlisted men throughout the corps. (Even the pursuit flyers admit it, which is saying a lot.)

The group commander, Lt. Col. Robert Olds, and two of the Squadron C. O.'s. Majors V. J. Meloy and C. V. Haynes, graduates of the Army's Command and General Staff School, are qualified to command any sized outfit on land or in the air. Their skill as pilots? Unbroken since the World War when they first won their wings, as did Majors J. McDuffie and Barney Giles.

Others, too, have been through the mill of successful aerial accomplishment, like Capt. C. E. O'Connor, erstwhile test pilot at Wright Field, and Lieut. F. E. Glantzburg who, several years ago, with his skull fractured by another plane's radio antennae "fish", brought his observation plane safely to earth. Airplane commanders must have at least 10 years flying experience and 2,000 hours of flying with no or few accidents due to personal flying errors.

And while we are at it, let us not forget some of the skilled crew chiefs who also do their important part, Sergeants Haney, Kash, Cobb, Guitteriez, and Boutty, to mention a few.

So great are the responsibilities of the mechanic crew-chief of one of these large airplanes that there is serious consideration of alloting the grade of Master-Sergeant, the highest rank of a soldier, to the man holding such a job.

To the problems of pilotage and of mechanical maintenance might be added one which concerns the air base commanders; the problem of adequate airports for such airplanes.

Where there is any danger of muddy or other soft airdrome surfaces that danger must be overcome by the installation of hard surfaced runways on the parts regularly used by the sixteen-tonners. Perhaps these same fields will some day feel the heavy rumble of even heavier war planes should the success of the big planes prove outstanding.

In time of war it might prove dangerous to house the super egg-layers in large hangars lined symmetrically about the landing field. Such a target would be too inviting to enemy aircraft. Each plane would have its own pocket as far as possible away from, but within towing or taxying distance from the runways; protected from bomb fragments by a sandbag wall, with a camouflaged gas-proof tarpaulin overhead. It would therefore take a direct hit from a hostile fast flying attack or high-flying bomber's bomb falling inside this protective wall to destroy or seriously damage the plane inside.

It is obvious that an airplane is most vulnerable to hostile air raids when it is on the ground. Tacticians and designers are working together to reduce this period of vulnerability.

Designing engineers say, "We can give you engine mounts which will allow an engine change during the time your plane is being refueled, reloaded with bombs and inspected mechanically."

Tacticians say, "In that case why can't we provide two or even three flying crews for each airplane? This would keep the airplane busy on patrol, search-attack or bombardment missions; we'd get the maximum use out of it and at the same time keep it where it's safest —in the air."

There's something to those ideas. Few of the thousand or so airplanes in a well-balanced GHQ Air Force will be large bombers. Perhaps not more

Though the Martin is literally an aerial battleship, Boeings and Douglases are now proving themselves so formidable that new tactics must be mapped.

than one bombardment group would ever be completely equipped with them.

These planes, because of their extreme range or endurance, would be called upon initially to perform patrol or reconnaissance flights or search-attack missions (where the plane is armed for a bombardment attack but is also searching for targets for such attack). Forty airplanes operated in turn by one of the three combat crews assigned each plane would give the same service as 120 such planes with only one crew, and be on the ground only 14 instead of 34 hours out of each 48-hour period.

For that matter *all* airplanes which operate day and night could well have several alternating crews and be operated continuously. Doughboys may sneer at the military airman's inability to function efficiently after more than about 12 hours in the air but where the major portion of such time is spent at high altitudes as in the case of bombing planes, extreme fatigue quickly results, even with recourse to oxygen.

The question of multiple crews for the super-bombers, while it affects the secret mobilization plans of the War Department, will probably not be a serious one for some years to come when wartime requirements for flying personnel are estimated; as it is not likely that we Americans will open up our purse-strings to provide our Air Corps with an adequate fleet of these large planes.

If multiple crew operations are tested in maneuvers and found satisfactory, there is a likelihood that the scheme may eventually include even the medium range bombers. In that event the personnel sections of the Air Corps and the General Staff, and committees in the Army War College will devote considerable time to revising their former estimates of just how many flyers are needed on M-Day to man the Air Corp's planes. Will that mean that more Flying Cadets will be trained in time of peace?

So much for the problems of personnel, training, handling at bases and piloting, presented by the big bombers. *The next is the most important one in the history of our national defense.*

For the first time in our history we are approaching the birth of an entirely

(*Concluded on page* 66)

Comparison of Bombardment Crews

SINGLE COMBAT CREW	Hours	THREE CREWS PER PLANE
Preparation for mission by crew		
		Crew No. 3 ferries plane from BA to ARB. (Crew No. 1 preps.
Flight from BA to ARB		Refueling at ARB. for mission
		Leaving ARB on mission
Refueling at ARB		M I S S I O N (Crew No. 1
Leaving ARB on mission		
M I S S I O N		
		Returning to ARB
		Plane R.R.&I. Crew No. 2 already prepared for next mission.
		Leaving ARB on mission.
Returning to ARB		M I S S I O N (Crew No. 2
Refueling at ARB		
Flight from ARB to BA		
Reports, etc., by crew after mission		
		Returning to ARB
Flying crew after being 19 hours on duty, 14 hours of which was in the air, not fit for duty until next 48 hour period.		Plane R.R.&I. Crew No. 3 prepared for next mission.
		Leaving ARB on mission
		M I S S I O N (Crew No. 3
Long after this airplane is ready for another mission it must wait on the ground while its sole flying crew gets necessary rest.		
		Returning to ARB
		Refueling at ARB
		Crew No. 1 ferries plane from ARB to BA.
		Complete inspection, maintenance and necessary minor overhauls at BA.
		Plane has operated 3 missions from ARBs. Has been on ground no longer than 2 hours at a time while at ARB.

One mission in 48 hours —RESULT— Three missions in 48 hours.
On ground 34 out of 48 hours. On ground 14 out of 48 hours.

ARB—Advanced Refueling Base, to extend working range of bomber. Defended by AA artillery and Pursuit Aviation. Operations Office there if necessary.
BA—Base Airdrome. Far back from front. Has shops and supplies.
R.R.&I.—Refueled, re-armed and inspected.
MISSION—Each mission about 10 hours, of which 8 hours would ordinarily be over sea or hostile territory.

This Boeing B-17 (Flying Fortress) is no longer just another Air Corps bomber. This latest aerial battlewagon is practically a separate unit and must be dealt with as such.

Pylon Polishing in 1937

by DeWITT WENDELL

This year's National Air Races featured several outstanding ships. Here's the lowdown on the champion.

This is the lightning-fast Folkerts racer that Rudy Kling (above with Mrs. Kling) flew to one of the most hair-raising air race victories in years.

THE airplane which won the Greve and Thompson trophy races at the 1937 National Air Races at Cleveland last month is a new machine which never had been proved in first class competition. Indeed it had been flown in only one other class "A" meet prior to those races.

It is a tiny shark-nosed yellow midwing monoplane with clipped high-aspect-ratio wings and a long slim fuselage. All bracing is from within and the tiny landing wheels can be retracted within the fuselage itself. In the air it reminds those who see it of the beautiful midnight blue Caudron-Renault in which Michel Detroyat, the great French flyer, took the same two races at the 1936 races in Los Angeles.

The creator of this machine is Clayton Folkerts, a veteran engineer who took part in the designing of the original Monocoupe and who later worked with the Waco company. He did all the stress analyses and indeed he did much of the basic work on the airplane itself. In particular he constructed the exceedingly ingenious linkage through which the landing wheels are pulled inside.

It was built to order for Rudy Kling of Lemont, Ill., its pilot in every race in which it has been entered thus far. Rudy, who is an airplane as well as automobile mechanic, also had a hand in its construction.

Dimensions of the plane are as follows:

Span	16 ft. 8 in.
Overall length	21 ft.
Landing gear tread	5 ft.
Overall height	4 ft.
Wing area	51 sq. ft.

Loadings are listed thus:

Gross weight including fuel, pilot, etc.	1,385 lbs.
Empty weight	840.5 lbs.
Wing loading (per square foot)	27.5 lbs.

The airplane is a slightly larger version of the highly successful machine which Folkerts built during the winter of 1935 and 1936 for Harold Neumann. While Neumann's racer *Toots* was powered with the aircooled Menasco C4S engine rated at 150 h.p., Kling's plane has the C6S Menasco rated at 250 h.p. at 2,250 r.p.m., and consequently is more heavily built to take the extra power.

Throughout, the machine is constructed of spruce and plywood. The wing, extremely light and very strong to withstand the four or five "G" strains which might be placed on it in tight pylon turns at high speeds, is of monospar construction. Fully cantilever, this wing is far more rugged than it appears, as was proved several times.

This spar extends from tip to tip, passing through the fuselage just ahead of the pilot and slightly above the fuselage axis. This type of construction has been found to be highly efficient. When Roger Don Rae landed *Toots* with wheels up at St. Louis after his propeller was shattered during a race, the wings successfully withstood a terrific beating.

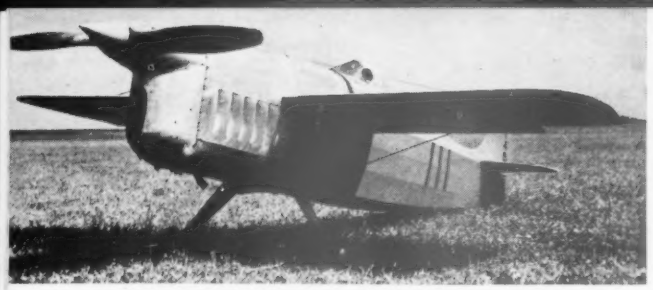
The ribs are built up of plywood and the covering for the wing consists of two layers of plywood which also bear much of the load. So carefully has the wing been worked that it appeared upon examination to have been covered with fabric and then sanded down to perfect smoothness, but the only fabric used was on the leading edge and the wing tips.

An observer is struck first of all with the fact that the wing section is very thin, obviously a high speed section. This means that the spar had to be extremely wide but not deep, and such is the case. The spar itself is attached to the tubing of the fuselage with four fittings, and the leading and trailing edges of the wing on each side also are held with four other fittings.

The fuselage is constructed in two parts, one the rear section, contains the pilot's seat and the tail group. The forward section holds the wing and the engine mount. Both these sections are triangular in shape with three main longerons. The streamlined shape of the fuselage is attained by wood fairing but the loads are carried by the main members.

The forward section also contains the linkage through which the wheels are extended and retracted. This is done by dropping a section of the floor and extending the gear through the gap thus left. The pilot supplies the power for this action with a simple lever which

Counterpart of the new Army P-35 fighters is this Seversky which won the Bendix race.



Steve J. Wittman, a Wisconsin school teacher whose hobby is racing, flew this and a larger homebuilt job.

After a mishap at St. Louis recently, Art Chester said he was through. But he was racing "Jeep" at Cleveland.

enables the maneuver to be accomplished with one push or pull.

When down, the wheels lock into place with spring catches and a tension is put on a shock-cord which absorbs most of the forces generated in landing. There is a play of five inches in the gear and Kling has had no difficulty in getting the plane down at any time it has been flown.

This is all the more remarkable, and speaks well for the designing of the airplane when it is known that Rudy Kling has no more more than 150 hours total flying time, most of this being on a J-5 Travelair biplane he owns at Joliet airport. Some of the success in landing the fast plane undoubtedly must be attributed to the flaps with which it is fitted.

The landing speed has never been carefully measured but it is estimated at more than 63 miles an hour.

The flaps are hinged to the lower surface of the wing and are of the purely drag type. That is—they do not add greatly to the lift but they do increase the gliding angle of the machine.

The slow landing speed may also be explained by the relatively low wing loading. Several of the latest transport machines—notably the Douglas DC-3—have loadings which are comparable. The DC-3's loading is 24.3 lbs. per sq. ft. as compared to the Folkert's 27.5. The Sikorsky S-43 amphibian has a wing loading of 25 lbs. per sq. ft. and the Sikorsky four engined clippers—the S-42 series—have 31.3 lbs. per sq. ft.

Kling's little plane can carry a total load of 61 gallons of fuel and 11 gallons of oil. The tanks are all in the fuselage, two 11 gallon tanks being placed in front of the pilot, and a main tank of 27 gallons and an auxiliary tank holding 12 gallons behind the cockpit. The oil tank is well to the rear and the long pipes laid along the main longeron member down the center of the fuselage floor are part of the cooling system for the oil.

In the cockpit all extraneous instruments and controls are eliminated. There are the rudder pedals and the stick, the throttle, a mixture control and a wobble pump. On the dashboard there are only five instruments: the airspeed indicator, manifold pressure gauge, oil temperature and head temperature gauges and the tachometer. There are no navigational instruments.

This souped-up Keith-Rider brought Earl Ortman in second in both the Thompson and Bendix speed dashes.

All the instruments named here are extremely important to the racing pilot who deliberately abuses his engine. Kling, who went to the Menasco factory and built up his engine himself, setting his own clearances and balancing up his own crank shaft and pistons, has a propeller which permits his engine to turn up to 3,300 r.p.m. at which speed the engine develops slightly over 400 h.p.

The temperature and manifold pressure gauges are the devices by which the pilot determines when he is exceeding even the high limits set for himself.

In racing the pilots use a special doped fuel which is approximately 95 octane. This is essential, of course, with the use of high blower ratios which in effect increases the cylinder compression.

Top speed of Kling's little machine is not known, but Folkerts says that his calculations indicate it should be capable of between 305 and 308 m. p. h. at full throttle. To date Kling has never opened the throttle full out for more than a few seconds at a time so that the ship was still building up speed when the engine speed was reduced.

Going into the Thompson race on Sept. 6, Kling took off with a full load of gas but with only 5.5 gallons of oil because he wanted the motor to run hot throughout the 200 miles.

The course at Cleveland was roughly quadrangular in shape with two long and two shorter legs. To finish meant that it would be necessary to fly 20 full laps. There were nine starters in the race which meant that the field would be well strung out long before the end.

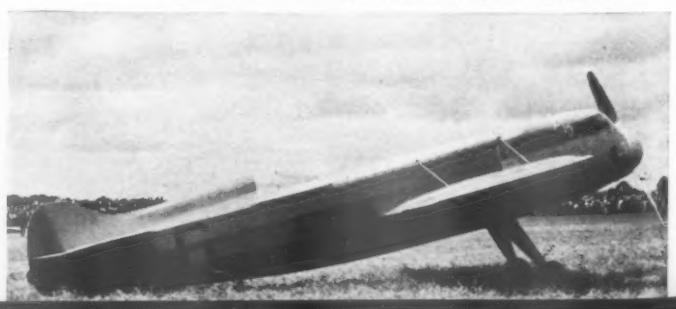
Anticipating that he would have difficulty identifying his position, Kling had arranged with his ground crew to signal him his standing on the fifth, tenth and fifteenth laps. One of the crew was to give him the signal to open up his ship to its limit during the later part of the race. He planned to cruise along holding fifth or sixth place during the early laps.

This plan was followed. At take-off Rudy was in eighth or outside place,

(*Concluded on page 76*)

Though he nearly killed himself in this Folkerts at St. Louis, Roger Don Rae was at it again at Cleveland.

This is Wittman's high-powered (Curtiss D-12) "backyard" racer. He nearly won the Thompson trophy in it.



Death Visits the Gates Pilots

by JOSEPH R. JAMES

In this article, the last of the Gates Circus series, the author tells of the sad fate of the old Gates Flying Circus airmen—including Ivan Gates himself.

JACK ASHCROFT, a well known Pennsylvania pilot and a member of the Gates' Circus for some two years, met his death by accepting a proposition that was turned down by yours truly.

A Long Island cashier, named Viola Gentry, was learning to fly at Valley Stream Curtiss Airport in the spring of 1929. After soloing, she proceeded to search for an angel whom she could promote for a plane and financial backing to do something spectacular and get thus her name on the front page.

It wasn't long before she had a ship, a Warner-powered *Cabinaire*, only one of its kind built, a cabin biplane somewhat resembling a present day job, and decided to go out for a women's endurance record, as that sort of thing was very popular at that time.

Being unable, herself, to do the delicate flying necessary for refueling in mid-air, she inquired of everyone to suggest a pilot to do it for her. Someone suggested me and the next day Martin Jensen, winner of the second Dole flight money, picked me up at Curtiss, hopped over to Roosevelt Field and introduced me to Viola and her angel.

I agreed to go up with her and practice refueling contacts with Emil Burgin, a well known pilot who was flying Bert Acosta's old Fokker. Emil and I had no trouble making three contacts. Viola was elated and after landing we four, meaning Viola, her angel, Emil and I, went into a huddle to arrange the details. I was promised a third of whatever accrued as a result of this flight.

Just before the flight I was advised that it would be good business to have this agreement in writing. Viola's angel refused to commit himself on paper and so I decided to stay on the ground until he made up his mind. Here is where Jack Ashcroft came in.

He was contacted and readily agreed to hop off the next morning making arrangements by telephone with Karl Dixon, a Hartford, Connecticut, pilot. Viola and Ashcroft hopped off on schedule in the loaded *Cabinaire* and, after staying in the air all night, their fuel was diminishing rapidly.

Joseph R. James, the author, who also was a Gates Circus aviator.

In the meantime, a typical Long Island fog rolled in over the greater part of the Island, covering not only everything below Viola and Jack Ashcroft, but also keeping all the ships on the ground, including Karl Dixon's refueling ship. He never left Hartford. At about six in the morning fuel in the *Cabinaire* gave out while Jack and Viola were aimlessly cruising over a sea of fog, not having any idea whether they were over land or water.

When the motor finally quit cold due to lack of fuel, they simply had to come down, settling through the fog as best they could. Since this was is 1929 and before the days of scientific instrument flying, they simply went into a dive and stopped only when a heavy tree down below refused to budge. Jack was crushed between the dash and the heavy tanks and died within half an hour. Viola was in a hospital for two years, having suffered broken legs, arms, ribs and various other internal injuries. She never did recover completely and is not flying any more.

Pilot John Cecil from Illinois, who was only a short time with the Gates outfit, was killed one night not far from Pittsburgh while flying mail between Cleveland and Pittsburgh. Incidentally, he was then flying one of the new J-5 Gates-Day New Standards.

Harold McMahon was the last and latest member of the outfit to lose his life. Harold saw considerable flying with the Gates Circus and had checked out only a week before I joined it. I was told that a four-ship formation of Gates ships was returning from the north, flying just a few feet above the old Hudson. Near Newburg McMahon's motor quit him cold and he just pancaked his ship and himself into the river. He struggled for his life for half an hour in the swift waters, finally swimming ashore.

After that experience Mac always had a lot of respect for water and reached for plenty of altitude when flying over even a narrow creek. Mac did pretty well flying for various outfits and for the last two years of his life was connected with some eastern oil company first flying a cabin ship and later graduating to a Lockheed *Vega*. Mac was proud of the new ship and very confident of its ability to "take it".

One summer day in 1934, Mac was observed over the southern part of Jersey in dirty weather, nosing his speedy *Vega* into a black cloud and pulling up into it. It wasn't more than two minutes after his disappearance that a loud explosion was heard with lightning flashing purple bolts here and there as bits of Mac's disintegrated wing fell out of the cloud.

The fuselage was blown wide open and plummeted to the marshy ground below with the speed of a meteor. Nothing was ever recovered of either Mac's ship or his body. A final tribute of pilots was paid to Mac as a squadron of commercial

Aaron "Duke" Krantz **Harold McMahon** **Wilmer Stultz** **Freddy Lund** **Ivan Gates**

Here are the famous stunt pilots of the old Gates Flying Circus with Ivan Gates ("the Pope") at the extreme right. Strange to say, more Gates pilots were killed after the Circus closed than during its wild career of barnstorming every state in the Union.

ships scattered flowers over the approximate spot where the largest part of the ship was observed to have fallen.

Ivan Gates, the "Pope" himself, seeing one failure after another, his ships cracked up or condemned, his factory in Paterson shut down by the depression, most of his valiant brood of flyers gone "west" on that final hop, the remainder scattered to the four winds, took to drink heavily. Out of sheer desperation, unable to make any sort of living in the flying business, with the meager remainder of his once vast funds bought himself a small "peep-show" and a shooting gallery combination on 46th and Broadway.

As this venture was far from the spectacular outdoor life that Ivan was accustomed to, he despised it deep down in his heart and repeatedly cursed his luck in the presence of Mabel, his second wife. It was seldom that "Pope" was sober now and during one of those hopeless and futile solo drunks he yelled that he would end it all right then, took a running start and crashed through the window to his death down below his twenty-third floor hotel room. So was ended the career of one of the most spectacular and famous men of the pioneering stage in aviation.

Among the members of the Gates outfit still living are Clyde Pangborn, Bill Brooks of Nicaraguan fame, Warren Smith who is now chief pilot for Pan-American-Grace (Panagra) airlines in Santiago, Chile; Gardner (Peg) Nagle, Shorty Bittner, Aaron (Diavolo) Krantz, Johnnie Runger, Nick Gungler and the author. A short biography and the outstanding accomplishments of those men up to the time of this writing is recommended in order to give the reader a true picture of the ever changing bizarre life of those restless spirits who were once banded together under the crimson colors of the Gates Flying Circus.

Clyde Pangborn does not need any introduction, having achieved world wide fame by flying around the world in 1932 with Hugh Herndon, winning a $25,000 prize for being the first man to fly nonstop a distance of 5,000 miles across the Pacific Ocean between Japan and the United States.

Pangborn was in headlines again when Vance Breeze organized his Air Express, Inc., setting up the fastest coast-to-coast freight and express service operating half a dozen Lockheed *Vegas* and *Orions*. Pangborn's name in connection with this venture was used chiefly for publicity purposes and poor Clyde, after working hard for a couple of months with Vance's outfit, quit in disgust due to the killing hours and schedules. This venture folded up soon thereafter.

In 1935, in company with Col. Roscoe Turner, Clyde placed third in the England to Australia race flying a standard Boeing 247. It is rumored that, had Clyde been allowed to proceed on his compass course while flying at night towards Karachi, India, the Boeing would have had an excellent chance of coming in second in the most grueling air race ever staged.

Instead, however, Roscoe mistaking tropical heat lightning for the Karachi beacon, swerved off his course, got lost at night in a tropical storm and, only by the grace of God and Pangborn's miraculous sense of direction, the Boeing was brought safely down at Karachi with only a couple of gallons of gas left in its tanks. Much credit for this achievement must also be given to "Nick" Nichols, a brilliant young radio engineer who tirelessly worked his direction finders and kept in touch with the entire world during this race.

Six months before this writing, the author stumbled into Clyde Pangborn at the United Airport, Burbank, California. I soon discovered what had brought "Pang" to the Pacific coast. He had purchased the Vance "Flying Wing" and was getting ready to fly some "first covers" from the Dallas Centennial Exposition to Paris and return.

"Pang's" original plans were to fly this job as far into Russia as possible for a new world's distance record. Once there he planned to make arrangements for mid-air refuelings for his proposed nonstop around the world flight in the Burnelli twin-motored transport.

It is a safe bet that this splendid, world famous pilot's name would have blazed across the headlines of the world, heralding new, hard won achievements in aviation again and again. Clyde Pangborn is, without a question, the greatest living pilot in the world today.

Next to Pangborn the most colorful living member of the old Gates Circus is old Bill Brooks, grizzled and rotund, bespeckled with heavy lenses, a rugged individual in his early forties. While engaged in operation of the Holmes airport at Jackson Heights, Brooks never lost his connections in Central America.

He figured prominently in the 1926 Nicaraguan melee. In 1934 he and Bill Alexander organized an aerial trade expedition into Russia, which failed to materialize for several good reasons. First, the ship, an old Sikorsky twin-motored land biplane which, by the way, was barnstormed by our famous "Diavolo" Krantz a couple of years ago, was set on two huge pontoons and equipped with long distance tanks.

The old crate, with Bill Brooks and Alexander at the controls, both dressed in brass button uniforms of their own design, was flown at last to Chicago. The pilots were dined and wined at the Army and Navy Club there, with the Soviet Ambassador, Mr. Troyanovsky officiating. It was to be a trade promotion flight be-

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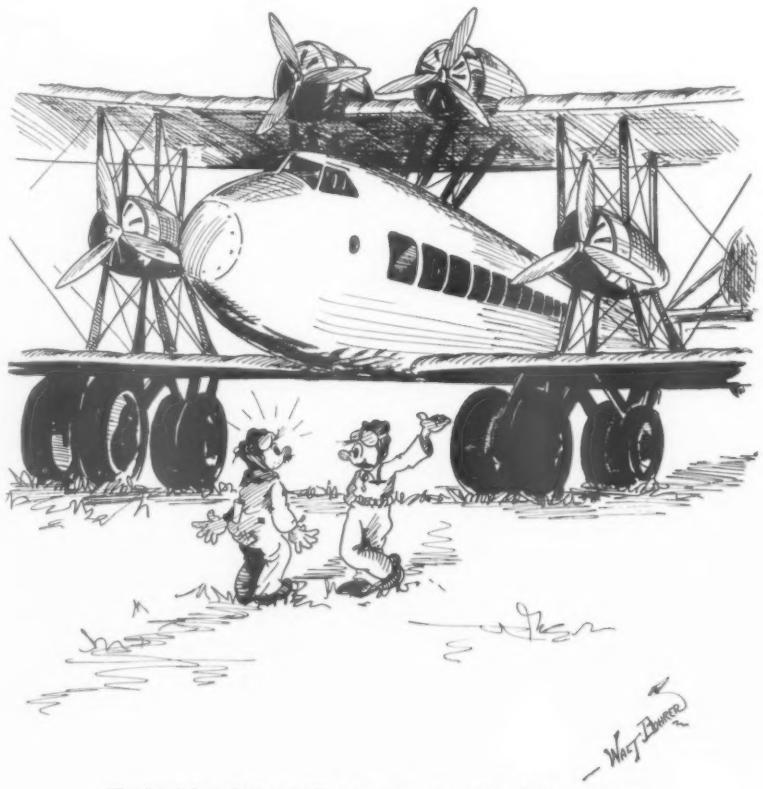
It Ain't the First Cost . . . but the Upkeep!



"Look! I bought her while you was away. She ain't exactly economical to run but I'll bet she will have a good trade-in value."

How Our Readers Build 'Em

Just to prove that our amateur builders are still batting them off in their home workshops—and doing fine jobs—we proudly present the following lightplanes.

Here are two views of Bill Stolzer and his homebuilt Corben Super-Ace. Sure is a trim ship, both in the air and on earth.

AMATEUR lightplane builders, the world over, will enjoy looking at the fine little home-built lightplanes shown in this article. And among those present is one of Les Long's famous little ships that has been adopted as a standard type by the Private Flyer's Association, Eugene, Oregon.

First off, just under the title, is the Corben Super-Ace, built by William Stolzer, 2102 Cumberland St., Little Rock, Arkansas. He built it directly from the blue-prints furnished by the Corben factory and the only changes made from the prints was the change from high-pressure tired wheels to air-wheels. The construction took about one year and a half, spare time, and was test hopped in July, 1937.

It is pulled through the air, with the greatest of ease, by a converted Ford motor equipped with a 50-horsepower Aeromarine propeller. Mr. Stolzer gives much credit to Al Floyd, of his city, and his brother F. L. Stolzer, for assisting him in the conversion of the motor which, by the way, was converted according to the Corben blueprints.

He has been flying the ship cross-country and all around his part of the state without having the least trouble. It has a top speed of about 100 m.p.h., cruises at about 85 m.p.h. and lands very sweetly at about 35 m.p.h.

Mr. Stolzer is highly pleased with the performance of the Super-ace for it outclimbs any other lightplane at his hometown field, gets in and out of small fields very easily and displays no tendency toward floating. In his estimation (and ours too, for that matter), it is as good if not better than the majority of factory built jobs.

Our old readers will remember that the full drawings for the Corben Super-Ace were published several years ago, serially, in POPULAR AVIATION and that there was a great deal of enthusiasm displayed over the ship at that time. In the hands of O. G. Corben, it gave the most remarkable exhibitions of maneuverability and climb.

And next on the list, at the bottom of the page, will be found photos of a fine little cabin job that is powered with a Ford V-8 engine. This is the Schauss Model "F", built by F. A. Schauss, Minneapolis, Minn. For a light cabin plane, the visibility is excellent and the builder has provided it with a good substantial landing-gear.

The radiator has been cleverly disposed of under the hood where it creates

Believe it or not, this is a homebuilt job! F. A. Schauss sure did himself proud here.

Leslie Long's "Longsters" are quite famous among homebuilt-airplane fans. Here's one of Long's latest models jogging along nicely near his home field at Cornelius, Oregon.

a minimum of resistance. It is of the biplane type with good substantial streamlined interplane bracing that forms a powerful truss for the support of the wings. Unfortunately, the builder failed to give us any detailed description of the ship or its performance, hence we will be compelled to pass on to the next ship.

The earlier models of the *Longster*, built by Lester Long of Cornelius, Oregon, are known to nearly every reader of POPULAR AVIATION. This low-wing plane has been under development for a long time and we see the latest up-to-date revision before us. As shown in the photo, it is flying at an altitude of 2,000 feet.

Here's a slick job from out in Boulder City, Nevada. It's Deward Franklin's ship built along the lines of the old Emsco.

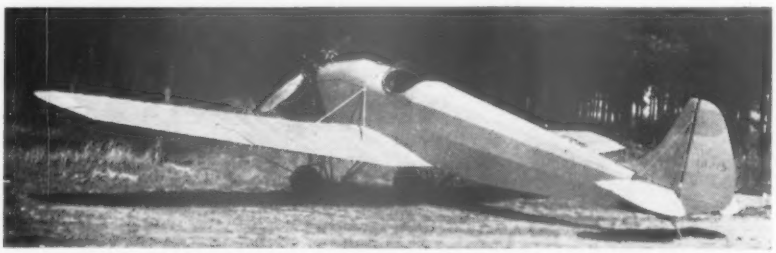
This lightplane has been selected as a standard type by the Private Flyer's Association of Oregon and has received the O.K. of the state aeronautic association. It is very stable, has no bad tricks and its spins are strictly normal. Wide open, it does 85 m.p.h. or better.

One of its best features is its landing, for it can be flown safely wide open until nearly on the ground or it may be stalled from any height without trouble. When four or five feet off the ground, it slows down perceptably and strikes at 25 m.p.h. without bouncy or tendency toward floating.

And now we have reached the fine little low-wing built by Charles Heiserman, 1127 Cedar Ave., Iron Mountain, Mich. This plane is the third built by Mr. Heiserman and is his own design. It has a span of 35 feet and is powered by a Velie M5 motor. The weight loaded is approximately 800 pounds.

These are just a very few more of POPULAR AVIATION'S readers who have been proving time and again that they can build their own airplanes—and do a safe, airworthy job of it. For several years we have devoted a great deal of space in this magazine in an effort to show the hidebound aviation industry in this country that the job of designing and building an airplane is not a mystifying series of wrist-twists.

END



Charles Heiserman of Iron Mountain, Michigan, designed and built this trim monoplane. He has built several ships, two of them his own design. The engine is a Velie M-5.

A Woman 'Chute Pioneer

THE second woman ever to make a parachute jump in this country, rose to her feet at the dinner of the "Early Birds" held in connection with the National Air Races. She was Mrs. Floyd Smith of California, slender, bright-eyed, and a grandmother.

"My husband was chief test pilot for Glenn Martin, early airplane manufacturer," she said "I was terribly anxious to learn to pilot a plane, too, and one day I told Mr. Martin so. That was back in 1914. I was just 21.

"He laughed and said 'Well, if you will make a parachute jump first, I'll give you a plane to fly!'

"I took him at his word. I took one of the early parachutes of the so-called 'attached type', and with Mr. Martin himself at the controls of a very primitive plane, we went aloft.

"I jumped. Somehow my 'chute opened all right and I sailed to earth without receiving a scratch.

"But the second time when I went aloft, to try it over again, I got an attack of the jitters. I looked over the side of the wing, and too late I saw that there was water below. I knew I couldn't swim. But since I was already on the wing there was nothing to do but let go. I did cling as long as I could to the ship before going off, I remember.

"Somehow miraculously I just missed that water. I never jumped again, but Mr. Martin gave me a ship to fly after that—a pusher type—and I was happy.

"Incidentally it might interest you to know that I was carrying my first child when I made that second jump. That child is now a full fledged engineer at the Douglas aircraft factory".

Fish Bites Airplane!

NO fooling, it really happened. The Central American Express, bound out of Vera Cruz, was viciously attacked, 2,000 feet above the harbor entrance by a *baby tuna.*

Diving out of the sky, he crashed right into the windshield brace on the pilot's side. Since the glass was only shattered, Flight Captain John Casio scraped what fins and scales he could get off and proceeded on to Guatemala City.

Landing at the port, he gave the following explanation to the startled airport maintenance inspector and his mechanics who crowded around:

He was sailing along peacefully enough, just having leveled off at 2,200 feet after his climb from the airport at Vera Cruz, when he saw a flock of frigate birds across his line of flight well ahead and above him. Suddenly a thud and a darkened windshield.

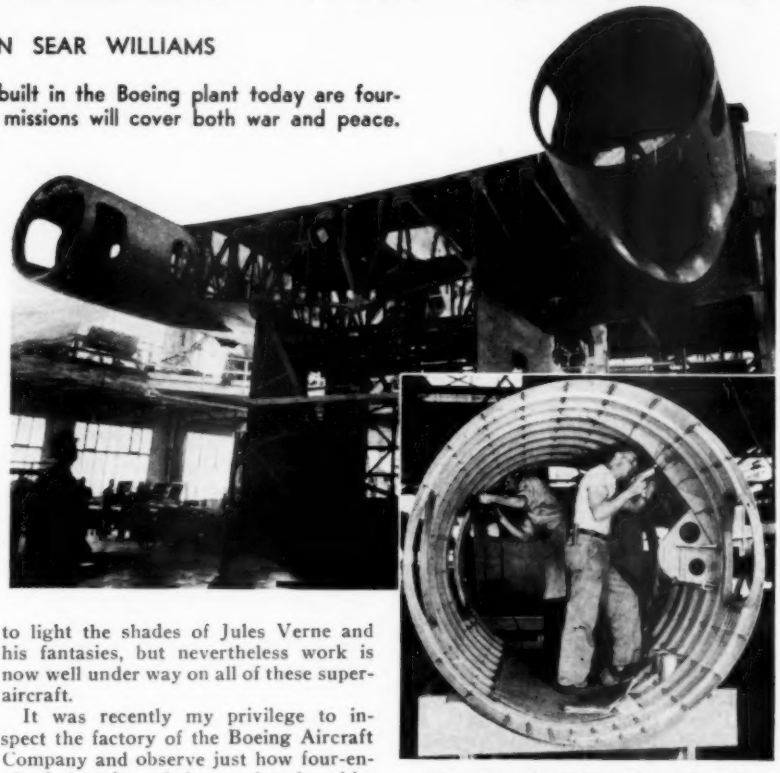
Startled by the close approach of the big mechanical bird, some frigate evidently opened his mouth in horror. And down dropped the tuna!

There you are. Simple, wasn't it?"

Boeing's Latest Air Giants

by GORDON SEAR WILLIAMS

Only new airplanes being built in the Boeing plant today are four-engined super-ships whose missions will cover both war and peace.



The mammoth center section and engine nacelles of the new Boeing flying boat are shown above. The nacelle in the inset is as big as an airplane fuselage.

RECENT activities of the famed Boeing Aircraft Company, long a producer of fine military and commercial aircraft, bring to light many interesting facts.

Although, heretofore, manufacturing all types of ships, from small single seat fighters to twin-engined Army bombers and commercial transports, the Boeing company is now producing only four-engined ships.

Naturally, the advent of these giant airplanes had not come overnight, but was rather the result of the evergrowing demand on the part of commercial operators and air forces for multi-engined ships. Not only is the safety factor increased in four-engined aircraft, but huge loads, of either military or commercial types, can now be carried in ease over hitherto unheard of distance.

Present plans of practically all of the larger airlines call for four-engined planes for the longer hops, while air forces throughout the world are casting envious eyes on our own Air Corps' Boeing YB-17 bombers. At the same time, ocean flying boat travel has reached the stage of being a practical means of rapid transportation. Thus the need is now felt for larger, faster, and more commodious ships in all three classes: transport, military, and over-sea flying boat.

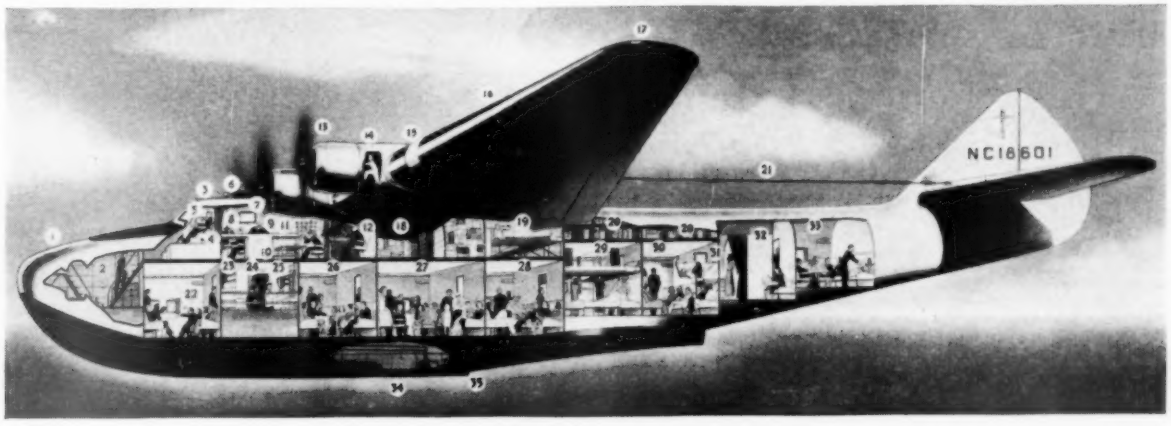
In answer to these many needs the Boeing company has undertaken a truly herculean task. Present plans call for the delivery in the next year of huge flying boats with a gross weight of 82,000 pounds each, and of supertransports for stratosphere and normal airline operations. Such a project may seem to bring to light the shades of Jules Verne and his fantasies, but nevertheless work is now well under way on all of these super-aircraft.

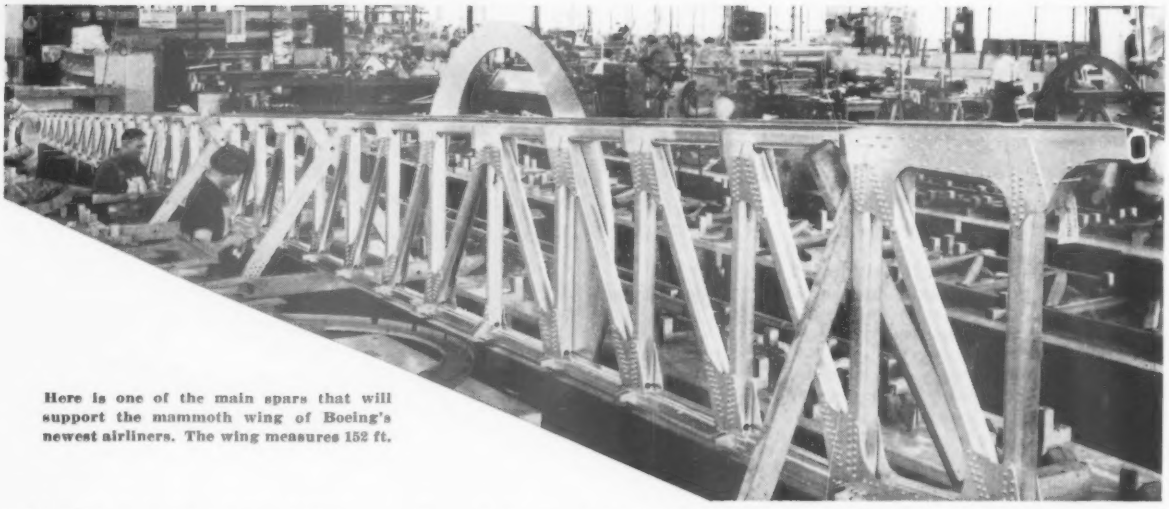
It was recently my privilege to inspect the factory of the Boeing Aircraft Company and observe just how four-engined aircraft are being produced, and by what methods such gigantic ships are designed and assembled. Although details of certain sections of this factory may not be released for publication at this time a special permit was obtained so that readers of POPULAR AVIATION could learn more of actual methods used in the Boeing factory in Seattle.

Incidentally, this is the first story of this type to be released since recent bans of the government became effective. Such a factory as this is as yet quite an oddity, as few, if any manufacturers have ventured to produce only four-engined airplanes.

As an introduction to this interesting plant it might be well to make a quick survey of previous developments of the Boeing company since its birth in a small shop on the shores of Lake Union in

This huge four-engined flying boat soon will undergo first flight tests. The numbered sections below are as follows: (1) anchor hatch, (2) seaman's compartment, (3) pilots' cockpit, (4) first pilot, (5) second pilot, (6) direction finder loop, (7) navigation compartment, (8) radio officer, (9) chart room, (10) map case, marine library, drift sight bombs, flares and navigational instruments; (11) engineering officer, (12) captain's office, (13) 1,500 h.p. Cyclone engines, (14) mechanic's wing station, (15) landing lights, (16) wing spread 152 ft., (17) navigation lights, (18) main cargo hold, (19) crew's sleeping quarters, (20) luggage holds, (21) length of ship 109 ft., (22) compartment for 10 passengers, (23) staircase to bridge, (24) men's rest room, (25) two stewards can prepare food for 85 persons in this galley, (26) passenger compartment, (27) diner, (28) passenger compartment, (29) passengers' berths, (30) passenger compartment, (31) women's rest room, (32) passenger compartment, (33) private suite, (34) auxiliary fuel pumps, (35) auxiliary hold.





Here is one of the main spars that will support the mammoth wing of Boeing's newest airliners. The wing measures 152 ft.

1916. Here, in a small frame building William E. Boeing built his first ship, the "B&W" seaplane trainer.

This rather flimsy-looking stick and wire craft seated two persons and had a top speed of but 65 m.p.h. A far cry from this archaic ship is the new Model 314 Clipper now being built in numbers for Pan American Airways. This huge all-metal flying boat has a wing span of 152 feet and will carry 80 people at well over 200 m.p.h. Thus is aviation history recorded in but a few years by the Boeing company.

Other famous ships built were the B-1 flying boat, the MB-3A single place Army pursuit, the PW-9 Army pursuit, the PB-1 Navy twin-engined flying boat of 1925, the F2B-1 and F3B-1 Navy fighters of 1926-28, the "40" series of mail-passenger planes, the famous "80" tri-motored transports, the Army P-12 and Navy F4B fighters, the Y1B-9A twin-engined Army bombers, the P-26A Army pursuit monoplane, and the 247-D commercial transport. More recently have appeared the YB-17 four-engined Army bomber and its experimental prototype, the "299". Thirteen of these speedy bombers have been delivered to the Air Corps.

One of the most interesting things noted in the Boeing plant is the diversification of its many departments. In all, 13 shops make up the plant organization and are as follows: primary, sheet metal, machine, welding, wood, body, control surfaces, wing, hammer, finishing, cable, assembly and yard crew.

In addition, this plant houses a large engineering section, composed of nearly 300 graduate engineers, a purchasing department that keeps an average stock of materials to a value of $300,000, an auditing department, an inspection department, and a production office.

Starting our tour with the engineering offices we entered a large, well-lighted room where busy engineers bent over their drawing boards. Specialized experts are constantly employed in stress analyses, new design work, and general production engineering and drafting.

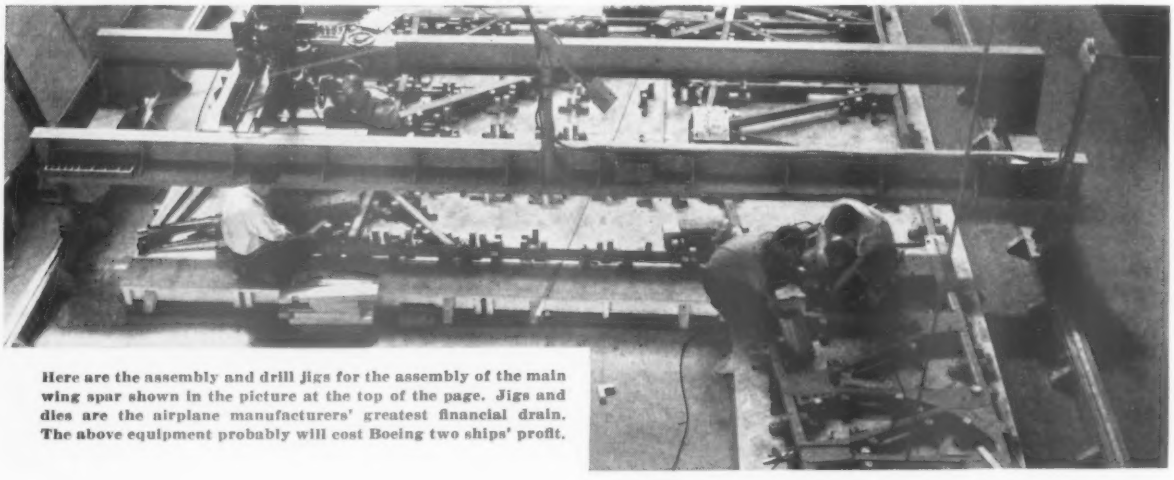
It was here that many drawings for the 314 Clipper and models 307 and 307-S transports were under way. All drawings are checked and rechecked many times to insure absolute accuracy before being sent to production shops. One of the most interesting items noticed in this shop was the use being made of large white-coated sheets of aluminum for drawing templates.

These large panels, some measuring 60 by 168 inches, are used by workmen for reference work much as a blueprint is ordinarily employed. All templates are drawn on whitened sheet aluminum also and with master holes drilled are used to check positions and alignments in the production line.

Leaving the engineering department we passed downstairs to the 314 Clipper "mock-up" room where workmen from the wood shop were busy completing an exact replica, in wood, of the full size 314. This "mock-up", was of course, in various sections, as to house a completely assembled model a huge building would be necessary.

In one corner of the long room was the upper deck section, while in another was the inboard wing section, complete with engine nacelles, and even dummy engines. In the middle of the room various parts of the spacious cabin were being erected to test seats, beds, companionways, and various fittings. A galley of

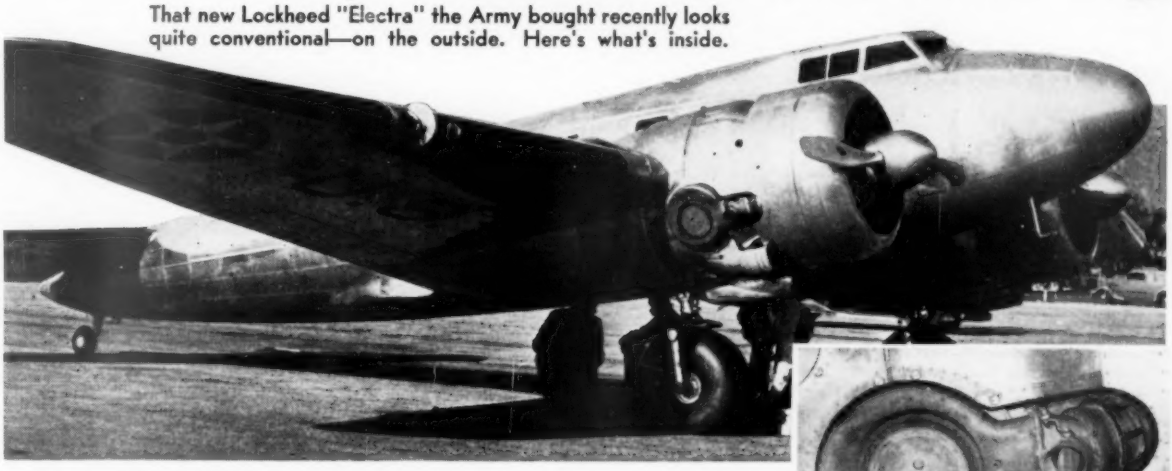
(*Concluded on page* 74)



Here are the assembly and drill jigs for the assembly of the main wing spar shown in the picture at the top of the page. Jigs and dies are the airplane manufacturers' greatest financial drain. The above equipment probably will cost Boeing two ships' profit.

The Army Goes Stratosoaring

That new Lockheed "Electra" the Army bought recently looks quite conventional—on the outside. Here's what's inside.



Only external departure from the well-known airline "Electra" on the Army Air Corps' new stratosphere laboratory is the cigar-like air-tight fuselage and the superchargers.

Two engine superchargers (one is shown above) cost the Army roughly $4,000 each.

THERE'S a new airplane in the stratosphere. It's not a cast-off mail-plane converted for publicity purposes. The new ship has nothing to do with the much-heard-of "overweather laboratory". It is strictly an upper-air research airplane recently delivered to Army Air Corps engineers at Wright Field, Dayton, Ohio, by the Lockheed Aircraft Corporation.

Officially designated as the XC-35 (Experimental Cargo—Model No. 35), this interesting new airplane will, according to Air Corps officials, be used "for the examination and development of engineering practice connected with high-altitude operation of pressure compartments". When POPULAR AVIATION asked Air Corps officials whether they intended using the ship for any Air Corps publicity or ballyhoo flights, the reply was short and to the point: "No altitude or speed records are contemplated—or will they be attempted".

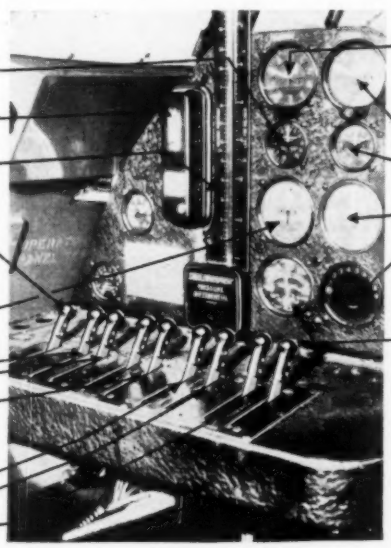
In describing the XC-35 to POPULAR AVIATION, Army engineers emphasized the fact that this particular airplane, its instruments and controls "are primarily for research and test purposes and do not represent actual pressure requirements such as would be used in the standard pressure cabin airplane of the future".

Though the maximum ceiling of the Army's new stratosphere ship is calculated to be 36,000 feet, the airplane is designed for normal operation at 25,000 feet, at which altitude all research work included in the program for the airplane can be carried out.

As this is written, the XC-35 has been flown almost 100 hours since it was delivered to the Army by Lockheed. Ten hours of this time went toward the ferrying flight by both Lockheed and Army engineers from Burbank, Cal., to Wright Field. To date, the majority of tests that have been made with the new ship have been conducted with moderate cabin pressures and at altitudes around 20,000 feet.

It long has been the belief of aviation engineers that the future of air progress lies at altitudes of from 25,000 feet upwards. With several airplane and balloon flights having been made into the stratosphere and sub-stratosphere during recent years, airlines have turned a more or less publicity-minded eye on that type of flying. But even under the guise of publicity, several interesting facts concerning high-altitude operations have been learned. Present-day aircraft, using controllable-pitch propellers, have been known to add up to 50 m.p.h. to their rated top speed. It is known that the rarified air at high altitudes has decreased resistance on the machine to the point where performance has been boosted quite noticeably. However, being able to fly an airplane at high altitudes has not been the big problem. The tough nut to crack has been the search for a means of carrying passengers safely and comfortably at great heights. The human body would burst at, say 50,000 feet. Likewise, an imaginary human born and raised in the stratosphere would be crushed by the earth's pressure.

END


PRESSURE RISE THROUGH LEFT SUPERCHARGER
CABIN TEMPERATURE AND HUMIDITY
LBS. SQ. IN. PRESSURE INSIDE CABIN
SUPERCHARGER AIR LOCK "OFF" AND "ON" (Permits passenger to leave plane through air lock)
AIR FLOW CU. FT. MIN. LEFT SUPERCHARGER
CABIN TEMPERATURE CONTROLS LEFT RIGHT
WINDSHIELD DEFROST CONTROLS
PRESSURE RISE CONTROL LEFT RIGHT
AUX. CABIN PRESSURE CONTROLS
OUTSIDE ALTITUDE
ALTITUDE INSIDE CABIN
PRESSURE RISE THROUGH RIGHT SUPERCHARGER
AIR FLOW CU. FT. MIN. RIGHT SUPERCHARGER
SWITCH
TEMPERATURE OF AIR AT VARIOUS POINTS IN SYSTEM

Strictly an experimental project, this instrument panel is for pressure research.

Wing Covering Kinks

Valuable advice on practical methods for covering and doping the wings of lightplanes that will be of interest to our homebuilders.

After a careful examination of the ribs, the spars and bracing comes the problem of covering the wings and properly doping and coloring the fabric covering.

BEFORE covering is started on the wing, it should be given a coat of dope-proof paint or aluminum foil wherever the fabric will touch the wing. This prevents the fabric from sticking and forming bubbles and wrinkles.

If you use aluminum foil, stick it on with shellac, applying the shellac to a small portion at a time and smoothing the foil out with the hands. The foil comes in several widths, the one-inch being used on the ribs and the trailing edge and the six-inch on the leading edge.

There are two accepted methods of covering, the blanket and the envelope. I do not recommend the envelope method because of the difficulty in getting the correct fit.

Measure the wing chord-wise and cut enough strips to cover the wing, making the strips about six inches longer than necessary, to allow for the seam and fitting. Run the strips around the wing chord-wise so the seams will be parallel with the ribs. Sew these strips together to form a large sheet. Tuck the edges under to form a French seam as shown.

Now, place the wing on two horses, bottom up, and spread the fabric over it allowing it to extend over the trailing edge about an inch. Stretch it tightly along the trailing edge and tack it lightly with carpet tacks. Stretch the fabric at the root rib about half as tight spanwise and good and tight chord-wise, tack lightly.

Now, go to the tip and stretch it good and tight both ways and tack. Now inspect the seams to see that they are parellel with the ribs, if they are out too much it looks awkward. Tack it lightly along the leading edge, stretching it chord-wise only, as stretching it spanwise will result in wrinkles.

This done, the wing is ready to turn over. In stretching the fabric on the top side, it is well to remember that most of the stretching should be done span-wise, if it is stretched too tight chord-wise it will sag between the ribs and no amount of doping will bring it up again.

Once it is tacked all around, you are ready to trim off the excess fabric, allowing approximately three-eighths of an inch for the seam. In sewing, use standard left hand twist linen sewing thread and plenty of bees wax. Start at the root end and use the base ball stitch, placing the stitches about a quarter of an inch apart. Tuck the edges under to form a nice flat seam.

If the root rib has a heavy capstrip, which it should have, to resist the pull of the dope, you may tack the fabric to the edge of the rib, cover later with pinked edge tape.

After you have finished the sewing, stand the wing up on the leading edge between suitable supports, keeping the leading edge a few inches up off of the floor. Take some quarter inch reinforcing tape and put it around each rib, placing it exactly over the rib and pinning it at the trailing edge.

You are now ready to begin the rib stitching, use a needle sufficiently long to reach through the thickest part of the wing. Use standard rib stitching cord, left-hand twist and plenty of bees wax. Cut a piece long enough to reach around the wing one and a half times. Start at the trailing edge and work to the leading edge, carry it only as far as the front spar. Sew with a single strand.

The seine knot is tied at the completion of each stitch, placing the knot on the top of the rib and at the right-hand side of the reinforcing tape, if it is left on top, it will show through the pinked edge tape that is to be put on later.

The knot is made as follows: Pass the needle under the thread between the new and the old stitch, from left to right, and pull down, forming the common half-hitch. Draw the cord tight and hold tight; next take the needle to the right, up and over the cord between the new and the old stitch, pass the needle from left to right, under this cord between the new and the old stitch, then under the half-hitch and through the loop formed just after the half-hitch, draw tight and at the same time forcing the knot to the right-hand side of the reinforcing tape. (See illustration.)

When you have finished the rib stitching, put the wing back on the horses with the bottom up. You are now ready to put on the first coat of dope. This first coat is mixed to the consistency of Karo syrup, and brushed on.

Work in to the fabric well, finishing by brushing parallel with the ribs. Care must be taken not to get too much dope on this first coat, or it will seep through, forming small lumps on the other side. Turn the wing over and follow the same procedure as on the bottom.

Allow this coat to dry thoroughly, in a room free from dust and the temperature about seventy degrees Fahrenheit. The humidity must not be too high as excess moisture causes blushing. Blushing is caused by the dope absorbing moisture and causing it to turn white when dry.

The first coat will cause the fabric to form large wrinkles, and the second coat will bring it back to the tautness it was before doping, the following coats give it its final tautness.

The pinked edge tape is put on with the second coat. One and a half inch tape is used for this. Brush a fairly heavy coat of dope along the first rib and lay the tape along the rib, working down with the brush. Don't stretch the tape too much as it will buckle in the middle, forming a ridge along the top of the rib. After you have the tape along the rib, dope the tape and the fabric between this rib and the tip of the wing.

Tape the next rib and then dope the fabric between this rib and the one just finished, working progressively along the wing. When you have the top finished, turn the wing over and tape the bottom just as you did the top. The tape should run from the trailing edge, around the leading edge and back to the trailing edge, where it is cut off smooth. After you have all the ribs taped, run a piece along the trailing edge and the tip.

Allow the wing to dry thoroughly and then sand with No. 220A sand paper, being careful not to sand through the

(Concluded on page 64)

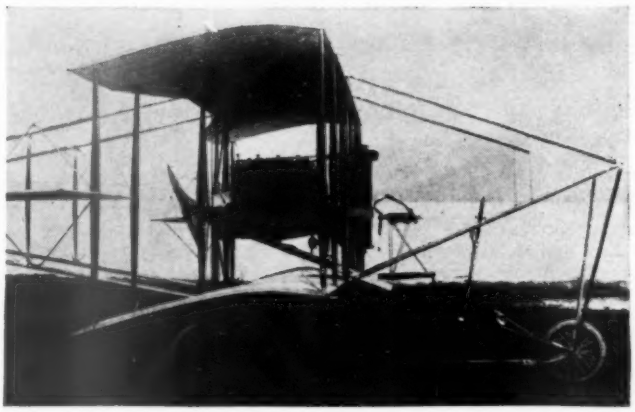
When conservative Waco Aircraft decides to "take a flyer" at three-wheeled landing gears, rest assured there's something to this idea.

As pointed out elsewhere in this issue, the Gwinn "Aircar" is the latest development to acknowledge the successful "tripod" comeback.

Whoops, My Dear, They're Back!

by EDWARD A. JONES

Step by step, we are getting back to the skids and skiis of the early days which were utilitarian rather than ornamental accessories.



Among the earliest of nose-wheels was that of the old Curtiss pusher which derived its name "tripod" from the position of her nose wheel.

When Dean B. Hammond developed this now-famous Hammond "Y", he started a storm of ridicule that has taken three years to quell.

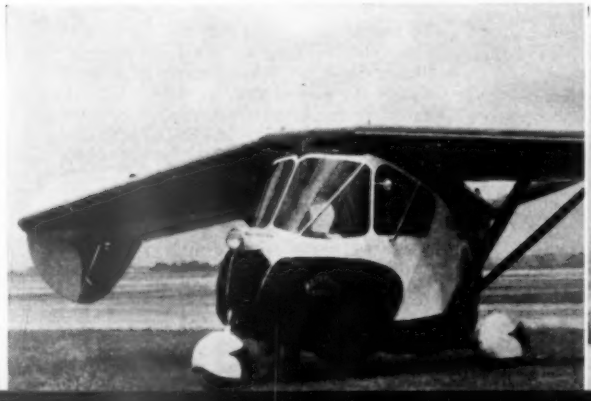
THIS all came about through a mistake. The mistake was made by Eugene L. Vidal, then chief of the Bureau of Air Commerce, who announced to an already antagonistic aviation world three or more years ago that his Bureau was sponsoring a "$700 airplane" for-the-man-on-the-street-who-wants-to-fly.

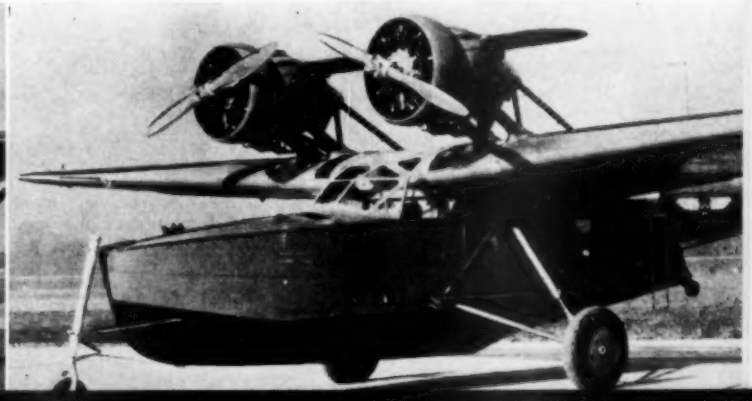
How much of a furore that statement made, readers of POPULAR AVIATION should well remember. The airplane was produced, all right, but it cost several thousand dollars instead of $700. Notwithstanding, though, the Hammond was the result of all this—and was the first of the modern three-wheeled "fool-proof" airplanes. The photographs on this page show the current status of the long-awaited return to the ultra-safe, common-sense landing gears of the days of the Wright brothers and Glenn Curtiss.

Like many "advancements" that have taken place in aviation during the past few years, the three-wheeled landing gear is, in reality, a graybeard. But, after all these years of "strenuous research work" on the part of aeronautical engineers, this old tried and true landing gear will appear on an airliner (where it could have been used admirably many years ago) for the first time next year.

Though the Hammond, Gwinn, Waco, Arrowbile and Douglas are the "last word", they have nothing on the Farman, Voison and Caudron of the past.

With Hammond leading the way (and taking it on the chin) "radicals" like Waterman (below left) and "conservatives" like the Army Air Corps (Douglas amphibian, below right) launched experiments with the gear. Thus, over all the protest, has the tricycle come back.





Gliding from Pike's Peak

by

THURMAN LEWIS KINCH

All sorts of things have been tried with a glider but the author (above) worked out this new wrinkle that, with an exception or two, had all the earmarks of being great sport.

IT WAS four o'clock Monday morning on the twenty-fourth of August. I stood among the crags on the summit of Pike's Peak, 14,000 feet above sea-level and watched the sun, dripping with fog, lift above the horizon. Soon its colored lances of fire dissolved the mist and a vast world opened about me.

Nearly two miles below and 15 miles distant on the plains Colorado Springs lay sleeping, indifferent. While in between stretched a great declivity, studded with granite peaks and imprisoning a maelstrom of air.

For the first time in all my visits to the mountain, studying air conditions and making preparations for a glider flight from its summit, I felt a sensation akin to fear. I felt light headed and giddy in the rarefied air, and the incredibility of a the situation had all the properties of a dream. But there was my glider moored in the lee of the Summit House, and the broken granite under foot was too cold and hard for a dream.

"Pike's Peak, glider launching site? Never!" was the answer received when I made the suggestion to old time flyers of the Rockies. They mentioned the treachery of air currents and winds that sometimes reach hurricane velocities. "A glider can't live in these conditions," they contended, amazed that I should even consider the possibility.

I have spent much time studying the forces and behavior of air currents in the region of this famous mountain, as they would affect gliders, and I am convinced that launching a motorless airplane from its summit and flying through the turbulent air to the plains is possible with ample margins of safety. "Why not?" I asked myself, when a chance remark suggested the idea. Thereupon I plunged into lengthy consideration of every detail and satisfied myself, in theory at least, that such a flight is entirely plausible.

I believe there are important advantages to be gained in selecting the right type of glider to use. "A sailplane!" was the spontaneous opinion offered by local pilots and friends of my flying circle, but this did not appeal to me. The high lift of their great wing area is naturally to be desired for operation in rarified air. This, however, is the only advantage as pitted against its slow maneuverability and lack of stress to withstand severe wind conditions.

A short wing spread and quick response to control are desirable assets for successful launching from the Peak summit, and the violent cross-currents to be met will try the strength of the best glider built. My own judgment settled upon the soaring utility glider, which has strut bracing for the wings.

These ships, stressed for airplane towing, have the inherent strength one should have for safe flying in this region. I feel that what lift efficiency is gained in the sailplane over the utility, can better be sacrificed by a pilot for the safety of strength on the pioneer flights.

Characteristic of the extremely rugged terrain around Pike's Peak, the wind currents vary sharply in direction and velocity. While they make possible many soaring sites, they are also accompanied by down-drafts of dangerous speed and depth.

A glider hoping to navigate such air conditions should be well supplied with accurate instruments. Among a half dozen of these which would be useful, an airspeed indicator, altimeter, and variometer (which very sensitively records rate of climb) are especially important.

When it became known that I actually intended launching my glider from Pike's Peak, pilots with much mountain flying experience tried to dissuade me. "How can you safely launch from the top of the mountain," they wanted to know, "when our ships encounter down-drafts a couple of thousand feet *above* the summit?"

This question is no problem for the glider pilot. Supplied with a powerplant, aviators fly whither they choose, regardless of air conditions about them or the terrain below. Air currents and gravity propel the motorless plane. To sustain it a pilot must understand the thermal and mechanical action of air, and how it is influenced by the topography beneath it.

Pike's Peak rears a vast rocky slope 3,000 feet above timberline, 8,000 feet above the nearby plains, and is isolated by many miles from any mountains of comparable height.

One side of the mountain is an even gradient for three miles from shoulder to summit. Except where storm conditions disturb its normal behavior the prevailing wind blows up this slope. Deflected upward against this great area it produces an evenly flowing stratum of "solid air." As it flows past the summit and tumbles down the leeward slopes it becomes a raging vortex providing hazardous flying for the pilot getting caught within its confines.

Deviations occurring in the contour of the windward slope will cause plenty of cross-currents tending to drift the ship from its line of flight, but a pilot need fear no sink-holes for even these irregular currents will exert a lifting force as they rise to converge with the main stream of air.

By launching from the Peak into this lifting current and circling within its area, I believe a pilot should be able to soar his craft a thousand feet or more above the summit.

In any event, beginning the flight across the intervening mountains to the plains, plenty of altitude will accumulate under the wings as the slopes drop steeply away. Since the mean gradient from the summit to level country is steeper than the gliding angle of a ship, a pilot should sail clear of the mountains without the aid of soaring, and in spite of any altitude lost in negotiating down-drafts.

For my own flight, I had charted out a course direct enough to be within easy gliding distance of the prairie, and yet including likely soaring sites along the route.

(*Continued on page* 70)

Interesting Points in Air Law

by HARRY HIBSCHMAN

Part II

In his second article on this subject, the author sets forth many useful facts concerning the liability of air carriers and the various court decisions so related.

The most minute maintenance of the modern airliner is a vital task of the airline today. Only the utmost thoroughness keeps the airline's law suits at a minimum.

REFERRING to the rules germane to the issues as having originated in the days of the stage-coach and the railroad, the trial judge noted, "There are many more factors that are unknown, unforeseeable, and not preventable in connection with an airplane journey than with a railroad journey," and then gave the usual instruction defining the duty of the carrier.

As the attorneys for the airline contended strenuously that the snowstorm constituted an act of God and that the accident was unavoidable, the court instructed the jury with great care regarding those matters. Its verdict, however, was against the company, though only for the modest sum of $5,000.

(3) Glose against Curtiss-Wright Flying Service, tried in the Federal court in New Jersey in June, 1932, but based on an accident that occurred in Florida in 1929, when the pilot of a plane en route from Miami to Tampa attempted to land in a small field and crashed.

It was sought in the suit to recover for the death of C. Wm. Glose, killed in the crash; and the alleged grounds of negligence were that the pilot was flying at too low an altitude, that he failed to take proper precautions to avoid bad weather conditions, that he failed to make for the regular field at Tampa, that he undertook to land in a field that was not a regular landing field without being compelled by an emergency to do so, and that he attempted a sharp bank at a low altitude while gliding to a landing.

The jury brought in a verdict for the plaintiff in the enormous sum of $56,000; but Judge Clark, who presided, cut that down to $40,000, for which amount judgment was entered and later affirmed.

(4) Conklin against Canadian-Colonial Airways, tried in the Supreme Court of New York County, New York, in October, 1933, and based on an accident which occurred in April, 1930, near Jersey City, New Jersey, when a passenger plane headed for the Newark Airport collided with some high tension wires and crashed, killing the pilot and his three passengers.

This action was brought to recover for the death of one of the passengers, Arthur V. Conklin. It was the defendant's contention that the pilot was trying to make an emergency landing because of a heavy fog and that the accident was due to an act of God and was unavoidable. The trial judge instructed the jury on all the points previously discussed and charged specifically that the law did not hold the airline "responsible for the results of an unavoidable accident" nor "for an injury which results from some overwhelming agency over which it has no control."

In spite of that, the jury found for the plaintiff to the tune of $75,000. The Appellate Division of the Supreme Court reduced the verdict to $50,000, and judgment for that amount was affirmed by the Court of Appeals.

Now, of course, there have been other decided cases involving claims against companies operating airplanes for hire—for instance, cases involving sightseeing planes, in one of which verdicts for sums running from $7,500 to $25,000 were returned in favor of six different plaintiffs; but the cases listed are the main ones involving claims for injuries to, or the death of, passengers caught in accidents on the scheduled airlines while in flight.

The picture they present is, however, far from complete for the obvious reason that there is no available record of the cases in which the companies or the underwriters have made settlements out of court.

Yet in one of the cases mentioned above, where the company went to trial and won, it had previously settled out of court with the legal representatives of all of the other passengers killed in the same accident. One accident may, therefore,—in fact, has already—cost a carrier or the insurance companies over a quarter of a million dollars.

To protect themselves in the face of these possibilities some of the air transport companies have attempted to limit their liability by stipulating in their tickets that recovery in case of accident shall not exceed a given sum, for instance, $5,000 in the Conklin case and $10,000 in the Glose case.

But all such attempts are futile, for the courts have ruled long since that a common carrier cannot limit its liability in that way; and in the cases mentioned the courts promptly so held.

It is easy to understand, in the light of these facts, why neither the aviation companies nor those having claims against them are satisfied with the law as it has been evolved and as it now operates in such cases as those described.

The only thing about it that is certain is its uncertainty. No man living—no lawyer or law professor—is smart enough to predict with assurance the outcome of any lawsuit to recover from an airline operator for personal injuries to, or the death of, a passenger.

If the case goes to the jury—and it is not overly difficult to get it there—it is utterly impossible to forecast what that body of twelve good men and true will do. But, if the verdict is against the defendant, it is almost certain to be for an amount so huge as to become almost staggering when multiplied by the number of all those in the same situation as the plaintiff.

Figure, for example, the total liability of the carrier in the case of an accident like that which befell the American Airlines plane in Arkansas in January, 1936, when 14 passengers were killed, or that which involved a United Airlines plane in California, December 27, 1936, when nine passengers were killed, if the basis of recovery is that established in the Conklin case: $50,000 per passenger.

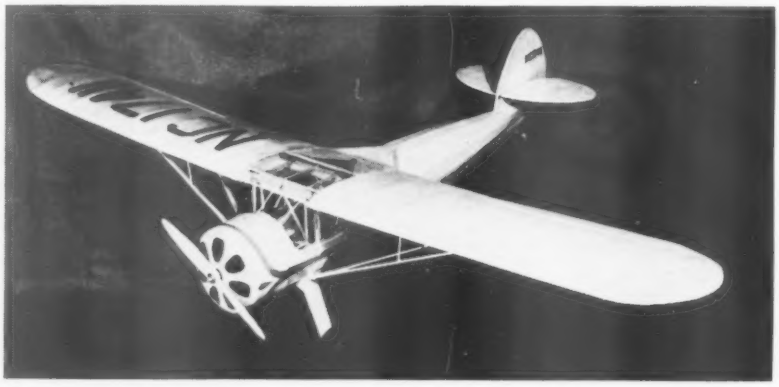
The law as it functions in these cases

(*Concluded on page 62*)

A Luscombe "Phantom" Gas Model

by

PAUL W. LINDBERG
Model Editor and Designer
for POPULAR AVIATION



The Luscombe "Phantom", one of the finest airplanes built in its class, makes an exceptionally good gas model. The clean-cut lines lend themselves to an excellent model.

OF all the gas models we have designed, we believe this model possesses more "gas model characteristics" than any other model completed in our laboratory. Its extremely short nose with the elevator located in the rudder make it an exceptionally stable flyer.

The ultra-clean lines of the *Phantom*, make it the envy of every model builder. The design as a whole may seem a bit confusing upon your first examination of the plans but I guarantee you that it is far easier to construct than it appears. All details are clearly shown on the plan, such as cabin door which may be opened to inspect the battery and interior of cabin. The motor may be used in an upright or inverted position. Any 1/5 or 1/6 h.p. motor is adaptable for this particular model.

Construction of Fuselage

The main longerons are basswood; all other upright and cross pieces are balsa. When the two sides have been constructed, the cross members are cemented into position. One-half inch No. 19 wire nails are driven through longerons into the upright and cross members of the fuselage.

From ⅛ inch sheet balsa cut the formers and cement them in their proper locations on the fuselage. After these have been applied, sand off any rough corners where the formers should over run each other. There are 18 stringers which give the fuselage its outer shape. A little patience is required in fastening these to the formers in order to make sure that they are spaced evenly. Stringers run the entire length of fuselage on the underside and one-half way up the fuselage. The remaining top stringers work from formers to rear of fuselage. The hatch in top of cabin is removable in order to work in cabin.

The photo of the framework shows the top of cabin covered with thin cardboard from the leading edge half way back on the cabin. This piece of cardboard has been eliminated and clear celluloid is applied to the top of cabin to give better visibility to the pilot. You will note this change in the finished model. From the trailing edge of the cabin to 7¼ inches back on the fuselage a piece of thin cardboard is applied. This piece is referred to as template No. 2. On either side of cabin is attached a thin piece of cardboard which is cemented into position to the tops of the stringers and outer edge of the cabin and part of the outer edge of template No. 2. (see top view of plan for general outline of curve).

One-eighth inch balsa ribs are attached to the top sides of the cabin (see side view of plan). After all cross pieces have been inserted in the top of the cabin, 5/16 inch drilled dowels are cemented in and bound with heavy thread.

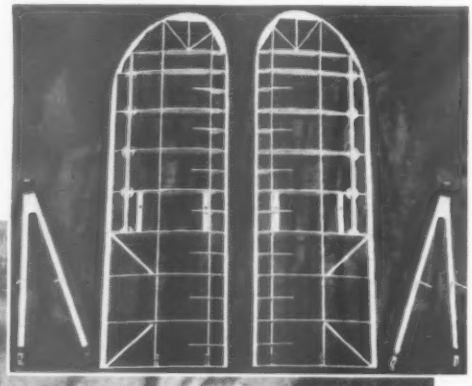
A ⅛ inch three-ply veneer firewall is attached to the front of the fuselage. Drive nails through the veneer and into the longerons and upright pieces so that it will hold fast. The motor mount is made of 3/36-inch half-hard aluminum or 1/32 inch soft steel.

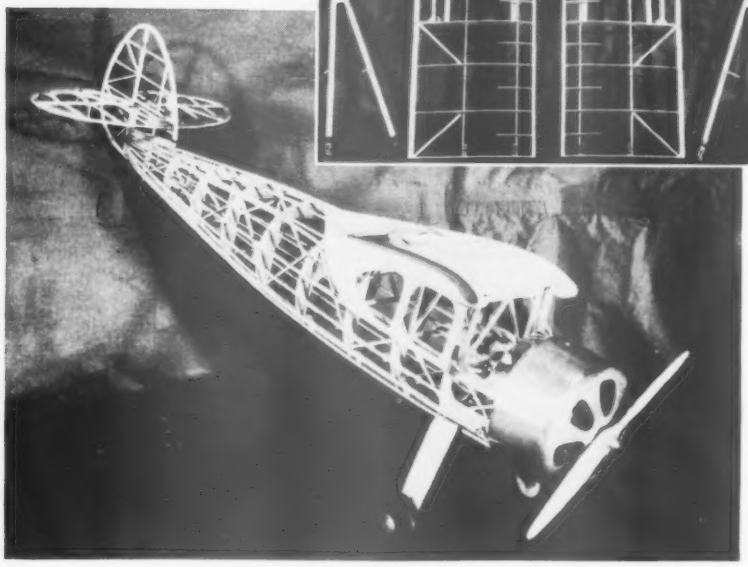
Construction of Landing Gear

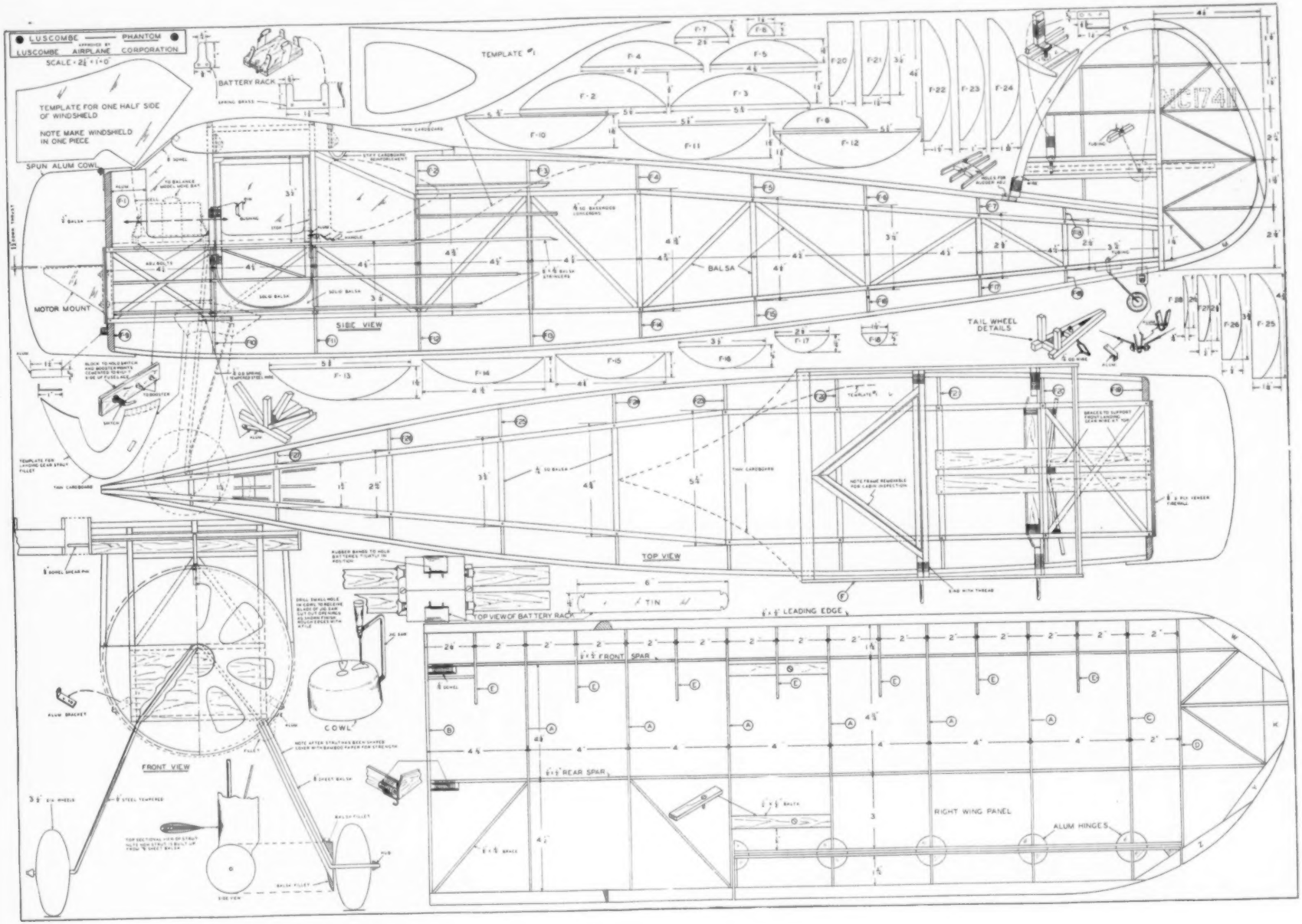
This type of landing gear has proven so satisfactory on all our models that we install it in this particular model. It consists of two pieces of spring tempered steel wire. The front piece forms the axles for the wheels and continues up into the fuselage. The rear wire is bound to the front wire at the axles and continues up across the bottom of fuselage. When these have been tied in place, the balsa fairing is applied to form the struts. A little time is required in forming the bottom of these struts which fair in with the hubs of the wheels.

(*Concluded on page* 56)

The picture at the right shows clearly how the "Phantom's" trim wing is assembled. The lower view shows the fuselage assembly.






LUSCOMBE PHANTOM
LUSCOMBE AIRPLANE CORPORATION
SCALE • 2½" = 1'-0"
TEMPLATE FOR ONE HALF SIDE OF WINDSHIELD
NOTE MAKE WINDSHIELD IN ONE PIECE
SPUN ALUM COWL
BATTERY RACK
TEMPLATE #1
F-1
F-2
F-3
F-4
F-5
F-6
F-7
F-8
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F-25
F-26
F-27
F-28
SIDE VIEW
TOP VIEW
FRONT VIEW
MOTOR MOUNT
BALSA
TAIL WHEEL DETAILS
TOP VIEW OF BATTERY RACK
TIN
COWL
LEADING EDGE
FRONT SPAR
REAR SPAR
RIGHT WING PANEL
ALUM HINGES

Gas Model

(*Continued from page 54*)

Construction of Elevator and Rudder

The construction of the elevator and rudder is very simple, as both are built to the front section, 3/16 of an inch in thickness. Construct these on a flat surface so they will not have a tendency to warp. The elevator is adjustable by means of an adjustment screw located at the center of the leading edge. Lock nuts may be applied here after the proper setting is had. The rudder is very simple and is clearly explained in details found on the plans.

Construction of Wing Panels

All ribs are cut from 3/32 inch sheet balsa. Spars, leading and trailing edge then are cemented into place. Do not omit any of the bracing between the ribs, as this is necessary to strengthen them. Five-sixteenth inch dowels are cemented to spars at the root of wings. Bind these with thread or string. The wings carry moveable ailerons, which are a great help when flying the model, as a small amount of wash-in is necessary to counteract propeller torque.

The entire model is covered with a good grade of bamboo paper. In applying the paper to the framework, ordinary model airplane dope will not do. Ordinary cement, thinned out slightly, makes excellent paper cement. In order to obtain a nice covering job, see that practically all wrinkles are removed.

Do not stretch the paper so tightly over the frame that it will have a tendency to pull it out of shape. After the various parts have been covered, dope with water. This will cause the paper to tighten over the framework. If a brush is used, extra precautions should be taken so as not to tear paper.

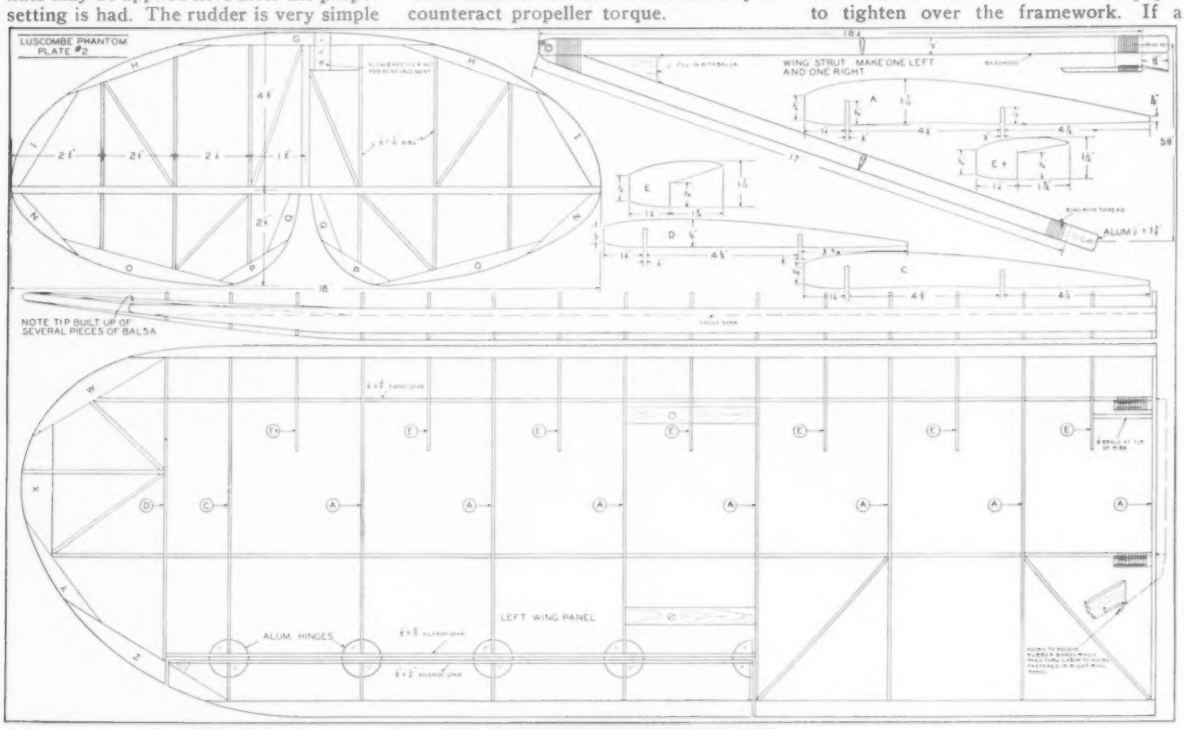
Any small spraying device is an excellent means of applying the water. After the pieces have become thoroughly dry, clear dope them. To obtain a smooth finish a light sanding is given between each coat. To finish off the model, color coats are applied.

Color used on this model is yellow trimmed in red. It is best to keep the lacquer thin enough so that it will flow freely. This will require an extra coat but the results obtained are well worth the extra effort.

Extra precautions are required in assembling the model as proper alignment of pieces must be obtained so that the model will fly properly. Please bear in mind that a little thought and study at this point will save many hours of additional labor in repairing your model.

If the wings are not exactly in alignment and are not square with the fuselage or if the angles of the two panels are not exactly the same, then the model will not fly properly and will be difficult to control. Careful measurements should be made in checking up these points.

END


LUSCOMBE PHANTOM
PLATE #2
WING STRUT MAKE ONE LEFT AND ONE RIGHT
NOTE TIP BUILT UP OF SEVERAL PIECES OF BALSA
ALUM. HINGES
LEFT WING PANEL

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A SERVICE OF THE RADIO CORPORATION OF AMERICA

Trans-Arctic Airline

(*Continued from page 24*)

with the possibility of an intermediate station. The route is not without its strategic significance in connection with any future international difficulties which might arise with the countries of the Orient. Sub-stratosphere and stratosphere flying, a matter of the near future, will remove the wing-icing hazard, increase length of both hops and speeds. Moreover, the stratosphere is reached over the Arctic area at an elevation about two-thirds that in mid-latitudes and its temperature is much higher.

For pioneering this route today a plane could take off at the railhead of Churchill and fly over the Magnetic Pole, Borden Island (1,600 miles) and Kotelnoi (3,100 miles) to Tixy Bay at the mouth of the Lena River (3,500 miles), where fueling would be made, and thence to Irkutsk (1,400 miles) the great airport of Eastern Siberia.

The trans-Arctic flying route from New York to Japan likewise closely approximates a great circle and passes over the North Magnetic Pole. The station of Fort Hope may be made common to the two Far Eastern routes. From Fort Hope the Japanese course for all weathers passes directly over the South Magnetic Pole to a station on Banks Island, a distance of roughly 900 miles. Thence the main trans-Arctic hop is to Wrangell Island (with much low flat land), a distance of only 1,200 miles. Because of its importance for flying routes the sovereignty of Wrangell Island has been much in dispute[5] but for the last six years it has been occupied by the U.S.S.R. as a radio station.

From Wrangell Island to Japan the course is over U.S.S.R. territory in northeastern Siberia to Japanese Sakhalin, a distance of about 1,900 miles, with another 1,000 miles over Japanese territory to Tokyo. The entire distance from New York to Tokyo is roughly 5,800 miles or about 1,000 miles shorter than the route to Peiping.

Chicago is even better situated for these flying routes, since the connection from Fort Hope would be by way of the railhead at Churchill (600 miles) and thence to Port Arthur (700 miles) and Chicago (350 miles). An alternative route is from Banks Island to Cambridge Bay on the south side of Victoria Island (600 miles), which has already been used as a gasoline cache, then Baker Lake, a station of Canadian Airways, Ltd. (450 miles), to Churchill (400 miles).

[1]Press Dispatches of April 28, 1910.
[2]R. E. Peary, Conditions in Arctic Regions, *Flying*, April 1914, pp. 78-79.
[3]American business interests in North China are largely concentrated at Tientsin, though Shanghai in South China is probably even more important.
[4]Personal communication.
[5]See V. Stefansson, "The Adventure of Wrangell Island," Macmillan Co., 1925. Also, "The Arctic as an Air Route of the Future," Nat. Geog. Mag., Aug. 1922, pp. 205-218, and chapter on Transpolar Commerce by Air in "The Northward Course of Empire," 1922.

END

The New Bloch 220

(*Continued from page 24*)

Weights

Weight, equipped empty	5,900 kgs.	(12,980 lbs.)
Crew, 3 men	240 kgs.	(529 lbs.)
Passengers, 16 persons	1,280 kgs.	(2,816 lbs.)
Fuel, petrol	970 kgs.	(2,134 lbs.)
Oil	90 kgs.	(198 lbs.)
Freight, postal matter, etc.	400 kgs.	(882 lbs.)
Radio set	100 kgs.	(220 lbs.)
	8,980 kgs.	19,759 lbs.

Performance

Maximum speed (full throttle)	350 k.p.h. (219 m.p.h.)
Cruising speed (58 percent of power)	300 k.p.h. (171 m.p.h.)
Flight radius (still air)	1,200 k.p.h. (750 miles)

Engines supercharged to establish power at 1,500 meters (5,000 ft.).

The cabin is fitted with large comfortable arm chairs, is well ventilated and sound-proofed throughout.

END

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The identical Gulf Aviation Gasoline and Gulfpride Oil that won at Cleveland are on sale at leading airports throughout Gulf territory.

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DARK HORSE RUDY KLING relied on Gulf Aviation Gasoline and Gulfpride Oil—and captured *both* the Thompson and Greve Trophy Races, two biggest closed-course races.

S. J. WITTMAN was a multiple Gulf winner, taking first place in no less than *four* events with Gulf Aviation Gasoline.

ROUNDING THE PYLON. Gulf Aviation products won or placed high in every single event they entered at Cleveland this year!

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF AVIATION PRODUCTS

Gates Circus

(*Continued from page 44*)

tween the United States and the Soviet Republic.

The shrewd Russians at that time were trying to negotiate a substantial loan in Washington and, therefore, were giving all the moral support necessary for this flight, although all financial backing was supplied by a wealthy New Yorker who expected to carry a few thousand samples of American goods to be exhibited all over Russia.

Several attempts were made to take off at Chicago and after dumping a couple of hundred gallons of gasoline into Lake Michigan the heavy old crate finally got off, only to catch fire and come down in a forced landing on Lake Erie some two miles off shore near Cleveland.

After several more forced landings, it finally reached New York again. In the meantime the Soviets were turned down flat by Washington on their expected loan and they immediately cancelled their permit to Brooks and Alexander, leaving them high and dry and leaving the New Yorker, who furnished the money and paid their salaries, "holding the bag".

Some months later one of Frank Ambrose's pilots was sent out in this same ship to get some important pictures off an incoming steamer about two hundred miles out to sea. The pilot figured he could pick up the pictures by swooping down low and catching the rope that held the package by a hook mounted on a tail skid. He caught the rope all right, but it did not break immediately as he anticipated and the ship and its four occupants were plunged in the heavy seas. The ship went down in five minutes together with one of the best old time Gates mechanics, "Happy" Johnson. So ended Bill Brooks' Russian flight.

Bill Brooks, besides being an excellent pilot, has another rather unique gift. He can tell by some sixth sense months in advance about an impending revolution in any South or Central American republic. On a recent coast to coast flight after landing on the North Beach airport

He hustled me off to his neat little apartment in Jackson Heights and after we exchanged numerous comments about this and that he broke down and confessed his two immediate desires, first, to learn to play his concertina like a professional and, second, yes, you've guessed it for old Diavolo is still single. Don't rush, girls, not before he learns to serenade you properly at least.

Warren Smith is undoubtedly better off in every way than any of the old gang. That winning smile of his helped him to get a first pilot's job with the old NYRBA (New York-Rio-Buenos Aires), retired by Pan American when this latter firm took over the assets of NYRBA and finally discharged by PAA, only to fall into a vacancy with Pan-American Grace, becoming its chief pilot after two years service.

When I last saw him in 1934 at the Chicago Municipal Airport he was back in the States on a vacation and also to ferry back one of the new Douglas ships his company was purchasing at that time. He has acquired an air of a successful business man with a sprinkling of gray in his hair and a most unbecoming "corporation." To the best of my knowledge he is still chief pilot for "Panagra" at Santiago, Chile.

Last, but not least, a word about the author. After the Gates Circus was no more, we all had to seek new places of employment, find a niche for ourselves. At that time a good pilot could have a job for the asking. In fact propositions were offered in such quick succession that it was hard to decide which one to take.

During the two years after 1927 I changed jobs rapidly with an eye on advancement and better remuneration. I was employed by Bob Aldrich of the Flyers Inc., at Albany, Curtiss Flying Service at Valley Stream, Newport Air Transport at Newport, R. I., and from there to anama with Pan American. I was informed by the local pilots that our old friend Bill Brooks had just returned from Honduras with the high commission as "Jefe de Aviacion Militar", meaning chief of military air service, and was now actually building this air force at Teterboro field.

Ten minutes later I was landing on Teterboro Airport and sure enough, there was Charles Vest, former Gates mechanic and now "piloto number one", according to his own proud admission, busily engaged (with the help of several roustabouts) in rejuvenating three old Boeing 95's, obsolete single-engined mailplanes and one modern Curtiss Condor purchased from Eastern Airlines. They were actually mounting machine guns and bomb racks on these ships and soon after left Teterboro for Honduras.

Aaron (Diavolo) "Duke" Krantz is now flying for the New York *News* together with that other old timer, George Weiss, who perhaps sold more airplanes on Roosevelt field than any other man. Krantz has equipped his plane with the best known instruments and radio and is a far, far cry from the old Gates crates on whose wings he used to perform some of the craziest antics.

He has grown older, of course, perhaps a little too much so. Whether it is because of the tough assignments he has to fly sometimes for the *News*, or the night life, or a combination of the two, his face now has some lines that I do not remember and that natty uniform cap now covers but very little hair.

And now a few words about myself. A few years piloting on commercial airways, flying tin geese through Central America.

Resigned Pan American to come to the States. Free lanced for a while in New York, worked for the Century Air Lines, operated an airline of my own between Chicago and New York, raised funds for a trans-Atlantic flight only to be cheated out of it by the promoters, free lanced again for a year or so and at the present time am sojourning in Southern California preparatory to going back to Central America.

END

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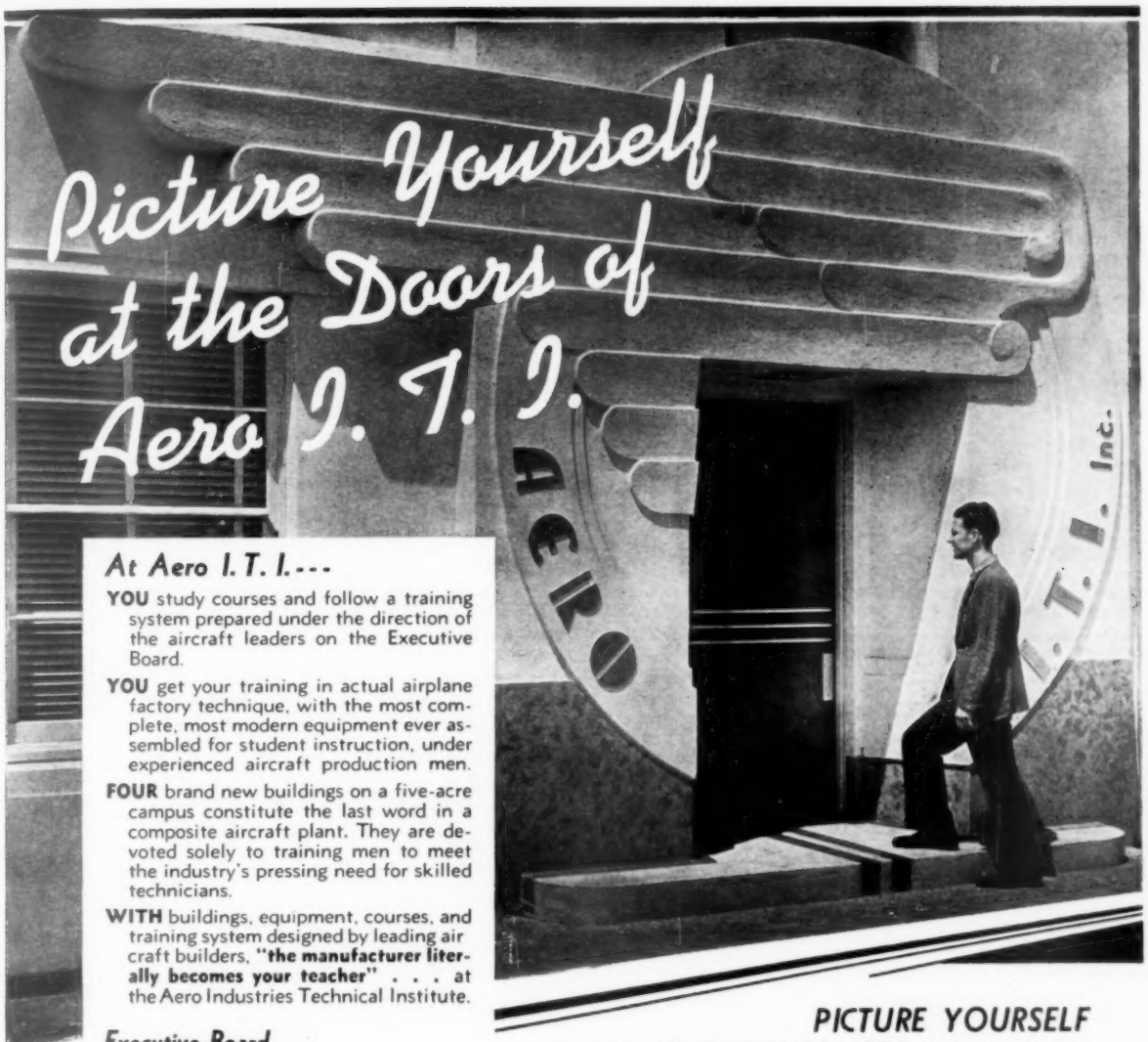

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Swanee Taylor

(*Continued from page 37*)

horizon. Here is one baby you won't dive the wings off of. And at stalling speed and posture she responds instantaneously and positively to all control action.

I don't think they would want me to say anything about their new type of flaps. So I'll just mention that they are the best yet, and that they are patented. Doubtless you will learn about them as time goes on. However, I do want to be allowed another minute or two to rave about the foot accelerator.

Strange as it seems, this foot "gun" is really delightful. What strikes you most forcibly is how very normally and naturally it fits into the technique of flying. Of course the first time you get up off the ground a ways, and start to un-lax, you get panicky when the motor begins to rev down. But suddenly it dawns on you that you gotta step on it—and that's all there is to it. From that moment forth you are eternally aware of power underfoot.

I recommend, unreservedly, the Gwinn *Aircar* to the average young up-and-coming family man. There's ample room in the spacious cabin for the wife, baby and you. And no doubt by the time there are additional increases in your midst Joe Gwinn will have developed a larger *Aircar* to accommodate all the progeny you plan to have—that is, within reasonable limits.

Ben Franklin's Ghost . . .

Some 180 years ago Benjamin Franklin sent out through the colonies a "road-show" to demonstrate his newly found phenomena of electricity. It was typical of that great early American that he should seek to share his knowledge with the world.

Today, or more correctly tomorrow, the Franklin Institute of Philadelphia—Poor Richard's spirit goes marching on—will send out another "road-show" to demonstrate the scientific truths of flight to a world far hungrier for knowledge than the early settlers. This latest show is a cleverly paced performance using working models, slides and slow-motion pictures to explain the many fascinating facts of bird and man flight.

Right now the Aviation Section of the Franklin Institute is "booking" the show. So have your club secretary write to Mr. Townsend Ludington at the Institute for further information. But have him do it soon, for such an amusing and entertaining performance is certain to be sold out far into the future.

Union Control . . .

Well, a big three-cornered squabble is in the offing for union control of the men and women earning their living in our Beloved Industry. And it seems to me that the Industry will do very well indeed to sit down and give the matter long and careful thought. You know, mass production engenders mass thought, and mass thought can be just as easily controlled as mass production. As a matter of fact, I believe that it is even easier to get people thinking along proper lines than it is to govern quantity output. The human mind is basically fair and reasonable, else we'd never had a single rebellion in history.

We all know that the A. F. of L., has organized the airline pilots and mechanics. And at their recent convention the United Automobile Workers (C.I.O.), changed their name to include aircraft workers. Which gives you an idea how the wind is blowing. While the third group is the United Aircraft Workers of America, who seek to organize separate "guilds" in individual shops including everybody—even the restaurant help.

In my interview with the chiefs of the U. A. W. of A., they set forth plans and aims which on the surface seem reasonable enough. They, according to their own assertion, don't plan to levy heavy tribute on the workers, taking only 30c of the monthly $1.00 dues. Nor, they vehemently vow, do they plan to organize the whole Industry as an entity. Their present membership, according to their own statement, includes some 20,000 workers in aviation. And I do know that the efforts to organize are being pushed along briskly.

Again I say that it is up to the manufacturers, or their duly appointed agency, to meet the situation as best they can. Let us hope that they will tackle the problem fearlessly, adult-mindedly and in a spirit of compassion. The honest workman needs protection from all forms of racketeering, internal as well as external. (Witness the recent shutdown of that California plant because the management and workers' agents couldn't arrive at a solution.) If the men want to "organize", by all means let them. But in the same breath, I beseech the Industry to stand firm against all efforts to intimidate the doggone swell bunch of men working with us. And above all things, it must *never* happen that any man has to pay for the privilege of working at a job in aviation.

END

Aviation Law

(*Continued from page 53*)

is manifestly unfair to all parties concerned. Yet the situation is not one that cannot be remedied. I suggest—and the idea is not original with me—that the solution is legislation compelling every air transport company to carry insurance for a certain stated sum for each passenger carried, just as it does now, but providing further that, when there is an accident, the carrier shall be automatically liable regardless of any question of negligence, the amount of the recovery, however, to be limited to an amount never exceeding a fixed figure and to be determined in some speedy but formal manner.

In other words, bring airplane carriers and their passengers under some law similar to the present workman's compensation legislation, assure the passenger indemnity if he is injured or killed, but limit the amount in any case to a reasonable sum.

Such a system, I submit, would pay the air transport companies in the long run. Certainly it would be better than the present system under which everybody takes a chance but nobody knows what the odds are.

EDITOR'S NOTE. While aviation law is now in the throes of organization, yet the principles are not so complicated nor involved as the legal problems faced by railroad and interstate bus lines. This is due largely to physical differences in the "right-of-way," the comparative liability of collision and the fact that the airways have an added dimension—the third dimension of space.

END

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Next 10 PRIZES—Any $1 kit in our stock.
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2. 50 ft. 1/8 flat rubber
3. 3 sheets silver tissue
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1/16x1/16 100, 5c
1/16x1/8 35 for 5c
1/16x3/16 18, 5c
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1/8x3/16 12 for 5c
1/8x1/4 10 for 5c
3/16x3/16 8, 5c
1/4x1/4 6 for 5c
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1x1 5c; 1/2x2 6c
1x1 1/2 9c; 1x2 10c
1x3 15c; 2x2 18c
2x3 25c; 2x6 35c
3x3 40c; 3x6 75c

TISSUE, AA
All col., doz. 19c
Silver ....ea. 5c
Superfine, wh. 5c

WHEELS per gr.
Birch Bisa Celu
1/2 .01 .03
3/4 .02 .04 .05
1 .03 .05 .07
1 3/4 .04 .08 .10
1 7/8 .07 .10 .16
2 .15 .20

NOSE BLOCKS
1x2x1 .....1c
2x2x1 .....2c
2x2 1/2x1 .....3c
3x3x1 .....5c
3x3x2 .....8c
3x3x3 .....10c

INSIGNIA
24 and stripes 5c

WASHERS
1 doz. 1/8 or 1/4 1c

THRUST BEARINGS
Small ...doz. 10c
Large ...doz. 15c

RUBBER
.045 ....25 ft. 5c
1/16 sq.. 20 ft. 5c
1/8 flat ..15 ft. 5c

RUBBER LUBRICANT
Large bottle 10c

PROP. BLOCKS
1/2x 3/4x 5 8—5c
1/2x 3/4x 6 6—5c
5/8x1 x 7 4—5c
5/8x1 x 8 3—5c
3/4 x1 1/4x10 3c ea.
3/4 x1 1/4x12 3c ea.
1 x1 1/2x12 4c ea.
1 x1 1/2x15 7c ea.

SHEET ALUM.
.0004x5x11 2—3c
.005 in. 6x6 5c
.010 in. 6x6 6c
.015 6 x 6 8c
1/32 6 x 6 15c

CLEAR DOPE or THINNER
5c per oz.; Large bottle, 8c; 1/2 pt. 30c; 1 pt. 45c

COLORED DOPE
6c per oz.; Large bottle 10c

CLEARCEMENT
5c per oz.; Large bottle 8c; 1/2 pt. 35c; 1 pt. 55c

PROPELLERS

	Mach. Cut	Paul-O-Wina
5"	4c	10c
6"	5c	15c
7"	6c	20c
8"	7c	25c
10"	8c	35c
12"	10c	45c
15"	15c	60c

BAMBOO
1/16 sq.x12, 36, 5c
1/16x1/4x15, dz. 10c

WIRE
6-8-10-12-14 .....2 ft. 1c

CELLULOID
6x8 .....5c
12 1/2x16 .....18c

ALUM. TUBING
1/16, 3/32, 1/8, ft. 7c
3/16 or 1/4, ft. 10c

BUSHINGS
1/16 ....4 for 1c

SANDPAPER
Doz. sheets....5c

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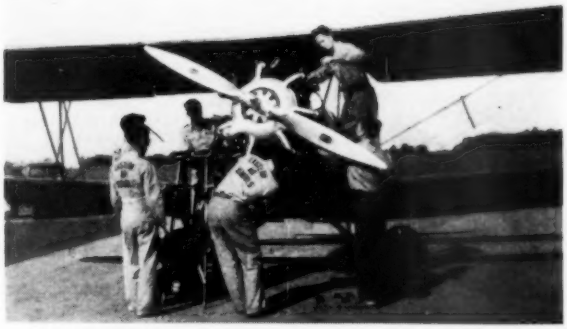

honor of being able to send these boys out into the aviation industry capable in every way—in the air as well as on the ground.

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"In the Heart of Dixie"

EASTERN AIR SCHOOLS, Inc.

BOX 291 **Salisbury, North Carolina**

Wing Covering and Doping Kinks

(*Continued from page 50*)

dope and into the fabric. Before putting on the third coat, put on the drainage grommets and patches where struts, wires and controls pass through the fabric.

The drainage grommets should be the celluloid type, they are much better as well as cheaper. Stick them on with dope, one on each side of the rib, as close to the trailing edge as possible; put them on the bottom side only.

Make all patches of canvas and sew around the opening in them to prevent raveling. Dope them on and put pinked edge tape around the edges. All wing walks should be given a canvas covering.

If you intend to use pigmented dope, two coats of clear dope is all that is necessary. If you intend to have a silver finish, then you may use three coats of clear dope. If you use pigmented dope, the third coat should be silver. The silver dope is more resistant to the harmful light rays than any other color, and it gives a smoother finish to the coats that follow.

In mixing the silver dope, you must mix the powder with the thinner, stir thoroughly and then add to the dope. If this procedure is not followed, the powder will remain in lumps which will ruin the dope.

You are now ready to put on the third coat, silver for pigmented finishes and clear for silver finishes. A spray gun may be used for the last three coats if you wish, it gives a better finish as there are no brush marks. If you use a brush you will have to be careful, as the silver streaks easily. Allow this coat to dry thoroughly and then sand lightly with No. 220A sand paper.

The last two coats are put on in the same manner. The last coat should be sanded with No. 400A sand paper and water, it is this treatment that gives them that slick finish that you admire so much. After this is done, allow it to dry, clean it off and wax it down.

After you have completely finished, take a sharp pointed knife and cut out the centers of the drainage grommets.

In covering the fuselage, if you have no wooden fairing to tack to, you will have to follow a slightly different procedure than with the wings.

You can usually get fabric wide enough so that you will not have to have any seams other than the ones along the line of the longerons. Run the fabric lengthwise of the fuselage, secure it with pins at the forward end and at the rudder post. Put the sides on first, then the top and bottom. As you put the top and bottom on, pin them to the sides along the line of the longerons, stretching the fabric tightly and trimming off the excess fabric, leaving about three-eighths of an inch for the seam.

Use the baseball stitch here, too, being careful not to pull the thread too tight, as it will cause the fabric to overlap and form a ridge, these seams must be flat. It isn't necessary to sew it anywhere except along the longerons and any openings such as the cockpits and forward of the rudder post, when that part is faired in with metal fairing because of the stabilizer being adjustable and fastened along the top longerons.

Around such openings, the fabric is secured to one inch reinforcing tape wound around the member that the fabric is to be sewn to. Before any member is wound with tape, be sure that it is painted, for the tape has a tendency to absorb moisture which causes rusting.

If your fin and stabilizer is built into the fuselage, you can make a nice fairing job between the two by covering them together.

You should have inspection openings wherever you have pulleys, levers or fittings of any importance. If the frame of these openings are of wood, you may tack the fabric to the inside edge and cover it with tape.

END

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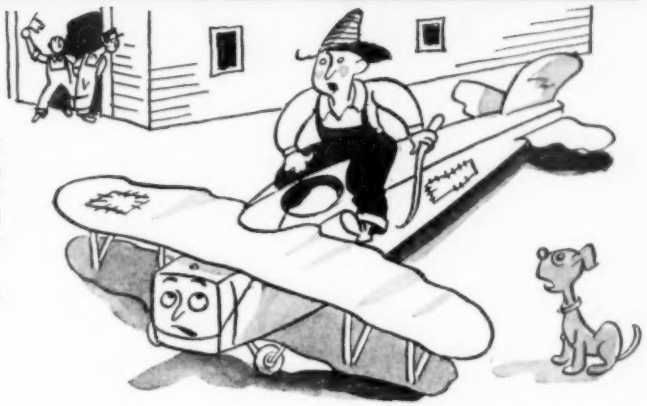

This month, our best fur-lined helmet is off to R. H. Wade of Kansas City, Missouri. Mr. Wade's whopper is one of the niftiest pieces we've ever had in this scandal sheet. How about you other birds putting *your* pen under *your* wing and sending us some more whoppers or fancy adventures or just plain gossip stuff? Direct all mail to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," *Mgr., Aviation Dept.*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

ABSENT-MINDED ARCHY

All that this lad's zeal for aviation landed him was a job pushing a lawn mower.

He was a private in the Army Air Corps. One day in the hangar, he was so intent on the model he was building, that he absent-mindedly walked right through the arc of an idling prop without a scratch!

The hangar chief (heart in mouth) saw all. Needless to say, Young Private qualified for the lawn job then and there.

I know, because I happened to be another ambitious private, and saw him do it (also heart in mouth).

—Ralston T. McLaughlin, Pittsburgh, Pa.

FIRST BABY EVER BORN IN A PLANE

Recently, we asked you Perchers whether there had ever been a child born in a plane.

Mr. A. L. Morfee, formerly of the Royal Canadian Air-Force at Cormorant Lake, steps forward—and produces the data.

Place: On board a Fairchild F.C.2. Enroute with emergency medical case from Mile 186 to "The Pas Manitoba." Altitude about 2500 feet.

Time: Winter of 1930-31.

Speed: As fast as the mill would drag the crate.

Baby: Cree Indian, male, weight unknown. Christened "Lindbergh Wright Cook." Surname: "Millar."

In attendance: Pilot A. L. Morfee and mechanic. Both half nuts.

Postscript: This birth caused a query as to how the nationality was established.

QUESTION BOX

Question: What is the Alchlor Process?

Answer: It is a special method of refining invented by Gulf, using aluminum chloride (hence: al-chlor). It starts where other processes stop—and gets as much as 20% more waste out of an oil.

Thanks to this exclusive process, *Gulf Airline Oil* (100% Pure Pennsylvania) is the world's best oil for planes.

LAND'S SAKES!

After the discussion *pro* and *con* as to "How Flies Land" by both the West and the East, we wish to speak in behalf of the flies down South.

In our research laboratories we find that the sober fly of the South lands at the top of a loop; and, to take off, simply finishes his loop—as any sober person can readily see.

But—the flies of the South, Suh, intoxicated by one whiff of Gulf Aviation Gas spin straight up to a perfect four-legged landing.

—Mack T. G. (The Great) Bass, Jr. and H. E. F. C. (His Excellency the Fly Scientist) Mosley Hussey, Jr.

THIS MONTH'S WHOPPER

Down the field come Ebeneezer, settin' in his JN wheezer. Come the time she oughta fly, he'd yank the stick and how she'd try! But somehow she was outa soup; that OX mighta had the croup. The way she sighed and rocked her arms, she filled Old Eben with alarms.

Slow she ambled down the path, and Eben, in his vicious wrath, stomped his feet upon the rudder, left one path to try anudder. Down she rattled by the shed, with Ebeneezer seein' red; and then he pushed against the rod and shoved her nose down toward the sod.

The Jenny screamed, "Now don't be rough!" but Eben yelled, "You choke that guff!" And when upon those ancient plugs the words of Eben fell like drugs, the Jenny started in to roar and down across the field she tore.

She picked her wheels up off the ground and looped and spun and rolled around; because she thought that Eb's word "guff" was just his way of saying "Gulf!" For even when that wheeze is chronic, GULF'S* a famous motor tonic.

(A "tonic," huh? Say, it's a bracer! Eben's JN's now a racer!)

**Gulf Aviation Gas, boys, is the full name.*

—R. H. Wade, Kansas City, Missouri

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

This Bombing Business

(*Continued from page* 40)

new arm in our scheme of warfare. Not a new *weapon*, but a new *arm*, on a par with the Army or Navy.

Regardless of claims made by air enthusiasts, the military or naval airplane to date has been nothing more than a new weapon or means of reconnaissance for the existing arms—the Army or the Navy.

Naval aircraft must accompany the fleet; they can't operate independently without it. (Naval bombers operating from aircraft carriers do not carry bombs large enough to sink battleships.) Army planes even though used independently of the ground forces, could do little more than operate beyond the strategic sphere of influence of the ground army.

The advent of the land-based super-bomber, however, is placing in our hands a fleet, or force, capable of striking at the base of operations of an air, sea or land force launched against the United States, if we assume a potential enemy to be a coalition of Western European or Asiatic nations.

So tremendous is the task of launching against us an overseas invasion by air, or on the sea by naval-protected army transports, that it is easily stopped by an opposing force of bombardment aircraft if only this aircraft has the range. The new super-bomber is approaching that capability.

Old World powers already have aircraft generally capable of attacking each other's naval bases and vital industrial areas. The super-bomber, however, is bringing the Old World within range of the New World—and vice versa, for other major powers are also developing large military aircraft. It is pretty well conceded by those in the know that at present only Russia has anything approaching our B-17 or XB-15; and the Stalinite articles are quite Model-T, to put it charitably.

Assuming that the next five years will see Europe and Asia (via Alaska) within our effective military aerial range will the odds be in our favor if we adhere to our present military defense policy and initiate no aggressive expeditions; leaving initial aggressive action to the other fellow? Or will this shrinking of distance militate against us, a normally peaceful nation, and bring our vital establishments and our cities within range of the other fellow who might hit us first and then declare war?

Unless we are forsaken by *all* the European nations, and that event is unlikely, no power will put all its offensive air effort in long range bombardment; it will still have to be prepared for a short range enemy allied to the United States.

This materially reduces the size of a potential long range aerial fleet which would be hurled against us by any coalition of enemy powers. It so lengthens the time it would take to cripple our naval bases and our essential industries that an overseas expedition of ground forces would be required to overcome our will to resist the enemy desires.

So large is the continental United States area wherein our airplanes might be based that it would be virtually impossible for enemy long range aircraft based *overseas* to locate and destroy our air force. The odds would be in our favor in counter air force operations conducted across the sea, for in Japan or in Western Europe there are fewer places for possible enemy airplanes to hide than in our country.

With the counter-airforce odds in our favor our air force would be able to survive, and surviving, *to stop any possible expedition against us from Western European ports.*

Our vital industrial area being in the northwestern part of the country is farther from Asiatic bases for land-based aircrafts than are vital Asiatic industrial areas from our West Coast, Hawaii or Alaska, from which our land based aircraft could be launched.

U. S. air bases to European industrial area distances are about equal to European air bases to U. S. industrial area distances. Both Asiatic and European powers, however, could shorten such distances by first establishing advance bases on Hawaii, Alaska, West Indies, or northeastern Canada.

Unless the United States were engaged in some other war at the time *or had neglected her land-based long range air arm*, the seizure or occupation of such advance bases would be virtually impossible.

We can conclude the following:

1. That the super-bomber is giving us a new arm of national defense.

2. That with such an arm in active being, the odds will be with this country against a possible overseas aggressor.

3. That our neglect of super-bomber development or failure to realize its possibilities will turn the odds in favor of an enemy possessing such an aerial fleet.

Naturally the development of such an arm progresses slowly. We are leading off with a dozen super-bombers in service and a great deal of experimentation. Meantime an eleven million dollar contract for 177 B-18, long range and fast, but *not* super-bombers has been let. They should serve the GHQ Air Force adequately until Air Force and other high military commanders determine the future of the super-bomber.

These B-18's are of Douglas manufacture and are basically much the same as the latest Douglas airliners. Air Corps officials do not look upon these as the type of super-bomber dealt with in this article.

The ships, though, that have started all this brain work in Washington, are the much-publicized Boeing four-engined ships now in "field test" service.

There is even a possibility that the super-bomber will not be looked upon as a bomber but as a long range reconnaissance or patrol plane; for there is a movement afoot in international political circles to limit all military airplanes to those of observation or reconnaissance types. That, however, is another story.

END

(Author's Note—While we have been dealing with the problems presented by the super-bombers let's not forget to mention and thank the nameless heroes of this new arm—the men who designed the planes that fly—the aero engineers.)

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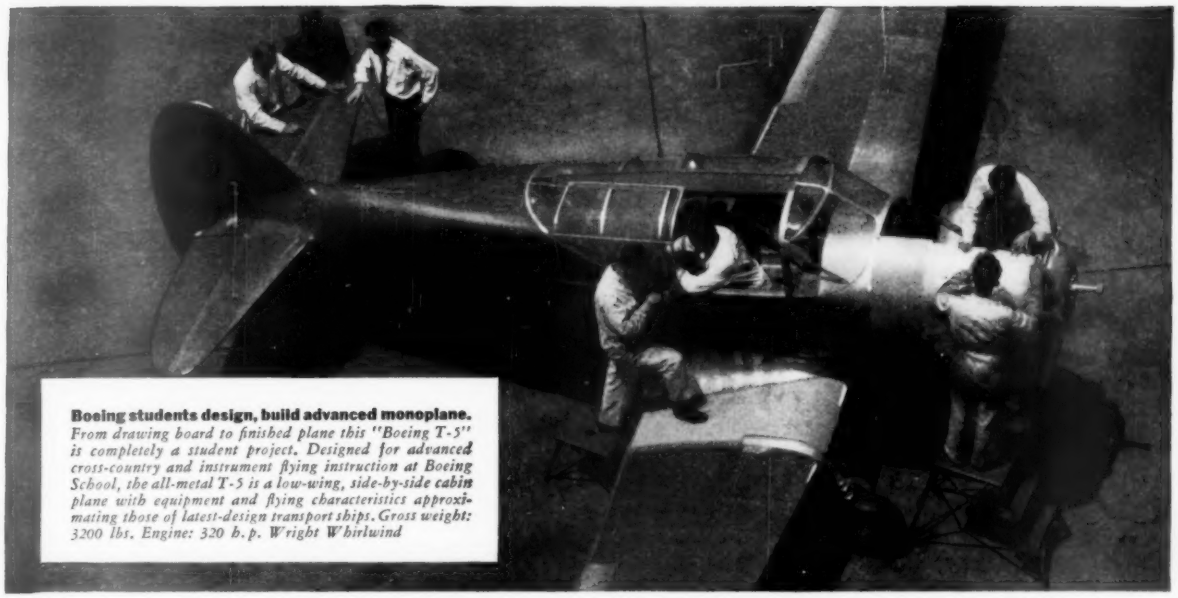

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Butcher Birds of the Air Corps

(*Continued from page* 13)

bombs could be accommodated. The wings measured 36 ft. 0 in. the length was 27 ft. 7 in.

In factory tests, without a bomb load and without full ammunition quota, the A-3B (as the production model was designated) showed a ground speed of 141 m.p.h. and an initial climb of 980 f.p.m.

The tests of the XA-3 continued until the year 1927 when the Air Corps took its first long stride in the development of an attack division of the service. It purchased 40 airplanes of the A-3B type. In one bound, so to speak, the Curtiss company sprang to the fore in attack plane production and since that date has been the most consistent producer of airplanes of this class.

In quick succession thereafter Curtiss produced the XA-4, XA-5 and XA-6, all of which were unsuccessful. All were identical with the A-3B in all practical details except as to motors fitted. The XA-4 mounted a *Wasp* R-1340 of 40 h.p., the XA-5 a *Conqueror* V-1500 to 600 h.p., and the XA-6 the odd Curtiss hexagonal, twelve-cylinder *Chieftain*.

The summer of 1930 saw the birth of the attacks plane as we visualize it today. Under the suggestions of the Air Corps officials, construction had begun in the Fokker and Curtiss plants on two attack planes which were nothing short of innovation. The Fokker was designated XA-7, the Curtiss designated XA-8, the latter unofficially dubbed the *Shrike*.

Ornithologists define the term shrike as a "butcher-bird" that impales its hapless victims upon branches.

In its original form the XA-7 was an all-metal, cantilever monoplane featuring cantilever tail-surfaces, open cockpits, two-bladed propeller and a shoe-over-wheel landing-gear. The geared, 600 h.p. *Conqueror* motor gave the nose a razor-sharp aspect when viewed directly from the side. A conventional tunnel radiator of "Curtiss" appearance was utilized.

The XA-8 appeared as a thin-winged, externally-braced monoplane with the direct-drive *Conqueror* giving the nose a blunt appearance. The XA-8 was distinguished in that it was the first military airplane equipped with slots and flaps and featured the unusual cabins for pilot and gunner.

The results of the competition between these two sky-demons has not been disclosed. However, it is understood that the Fokker possessed a superior climb while the Curtiss excelled in speed. Following is a comparison of the general dimensions: Fokker XA-7, wing span, 47 ft. 5 in.; Curtiss XA-8, 44 ft. 0 in.; length, 31 ft. 0 in.; 32 ft. 0 in.

The tests of the A-7 and the A-8 concluded in 1932 and disclosed that the A-8 had the more favorable characteristics, and the Army Air Corps placed an order for five YA-8 and eight Y1A-8B airplanes.

After the close of the contest the Curtiss and Fokker companies each produced an improved version of the products submitted in the original test.

The Curtiss plane, designated XA-8A mounted the geared *Conqueror* motor as did the early Fokker. In other details it followed the XA-8 exactly.

The Fokker, bearing the original designation XA-7, the alterations having been effected on the same plane issued to the Air Corps, featured an improved version of the landing gear sleeve as used on the XA-8, and was furnished with adjustable wind-screens that formed miniature cabins for pilot and gunner. An improved radiator was mounted beneath the motor which lent itself to cleaner aerodynamic design and, although the motor was unchanged, the nose was faired differently, the razor-sharp spinner and sharp downward slant of the nose fairing gave way to a rounded snout and rounded spinner.

In the almost universal adoption of air-cooled motors for attack planes which took place at a contemporary date, any benefits obtained through the improvements on the second A-7 and A-8A were not utilized and these models dropped into obscurity.

The details disclosed by the Air Corps at the conclusion of the service tests of the A-8B are interesting. Four .30 calibre Browning machine guns are mounted in the wheel-fairing. Each gun is fitted with 600 rounds of ammunition; another Browning of similar calibre and ammunition quota is mounted over the rear cockpit. The bomb load fitted is dependent upon the object attacked, a very wide range of weight being possible. The regular bomb loads are ten 30 pound fragmentation bombs, or ten 17 pound fragmentation bombs, or four 100 pound demolition bombs. The auxiliary bomb load can be either ten 25 pound fragmentation bombs, ten 30 pound chemical bombs or four 50 pound demolition bombs. The large demolition bombs are to be employed only in a day-bombing capacity against tactical objects rather than against troops, and in this fashion the A-8 is an auxiliary day-bomber. In the event of a night attack, each plane is equipped with two 250,000 candle-power flares, each burning for four minutes.

At this point the tacticians of the Air Corps disclosed some interesting information. The full attack plane squadron of today numbers 28 ships, which in attacking, separate into three-plane elements, each raking a particular bit of ground, the pilot being obliged to pass over the same area twice in order to concentrate his entire load in one location: the entire bomb load cannot be released in a single movement. As a protective measure the attack plane will fly low, its movements being screened by the contour of the terrain, directly in opposition to the tactics employed during the World War. In following this course of action the attack plane exposes itself to an attack from above, but a retaliative ground fire is virtually impossible, especially in artillery form.

The theoretical effectiveness of the attack plane is surprising. In a single fifteen-second dash a squadron of normal strength can drop 280 bombs and fire 35,000 rounds of ammunition. A regiment of soldiers, even when in anticipation of an attack, can fire only 12,000 rounds in an equal length of time.

In 1932 the Lockheed division of the Detroit Aircraft Corporation produced an experimental fighter, the XP-24. In sheer beauty of line the XP-24 set a high standard and its performance justified its appearance. Fitted with ground attack equipment, the XP-24 passed muster as an attack ship under the designation XA-9. As a result of these tests five additional A-9's were contracted for. The exit of the A-9 from the Air Corps was as swift and dramatic as was it success. The Lockheed company, owing to financial trouble, defaulted its contract and the original plane was destroyed by an explosion in midair which cost its pilot's life.

The attack plane activities of 1933 opened with the introduction of the Curtiss XA-10. In design the XA-10 was identical to the A-8B with the exception that a radial Pratt and Whitney *Hornet* of 675 h.p. was mounted. In appearance the A-10 smacked strongly of being a "made over" A-8B altered only with the requirements necessitated by the mounting of the radial motor.

With the destruction and non-availability of the Lockheed XA-9 model, the Consolidated Aircraft Corporation undertook the construction of a similar model designated as an XP-25 and XA-11, the planes being identical except as to armament fitted. The conclusion of the primary tests brought an order for four additional models. This order came as a surprise to those interested in the evolution of the attack plane, as the general belief at the close of 1932 was that the Air Corps had discontinued the use of liquid-cooled engines for this work. In the summer of 1935 the Consolidated company completed production on an order calling for 35 additional models of this type.

The last attack model to make its appearance during 1933 was the Curtiss XA-12. Unlike the A-10, the A-12 showed an attention to improvement over the A-8. The motor mounting and fuselage bore evidence of a cleaning-up process, while the fitting of the cabin was arranged with better communication possible between the pilot and gunner. The motor was mounted higher in the fuselage, raising the center of thrust. The performance improvement of the A-12 over that of the A-10 was approximately four miles per hour. Forty-six of this type were contracted for immediately

after the routine tests were concluded.

With the spring of 1934 the Northrop XA-13 made its debut, and created an enviable reputation for itself among the test pilots of the Air Corps. The construction is of metal with a large cabin top fitted over the cockpits. For armament four .30 calibre Brownings are concealed in the wings with 600 rounds allotted to each gun. A similar gun is mounted at the rear cockpit with a like number of cartridges. To aid in landing the A-13 is equipped with flaps. The power unit with which the A-13 was originally equipped was a nine-cylinder Wright *Cyclone* of 715 h.p.

In September of 1935 construction of the Curtiss XA-14 was completed. Only general dimensions are available. The wing is of cantilever construction, approximately 60 feet in span. The overall length totals in the neighborhood of 35 feet. Two double-row Wright *Whirlwind* engines of about 800 h.p. are fitted.

In the aforementioned type we have every essential characteristic that the army recommends in an attack plane, even to the extent of relying almost wholly upon speed as evidenced by the abandonment of the front gunner, a figure always associated with the multi-motored military tactical type.

A double-row *Wasp* motor was fitted to an A-13 and, after a slight cleaning-up process, the type was designated XA-16. Subsequently this type evolved into the A-17, a highly efficient type with a high speed in the neighborhood of 240 m.p.h. An order has been given for 110 of these aerial scythes of destruction and the consequent publicity given this type would make a description superfluous to the majority of our readers.

Three further improvements of the A-17 have been developed and designated A-17NA, A-17AS and A-19. The two former models incorporate the best features of the standard A-17, but mount smaller motors and are to be used for special work. The latter type is believed to be of similar construction to the A-17, but mounts a larger motor and has a retractible landing-gear.

With the conclusion of tests on the XA-14, 13 additional models of this type were contracted for and are now in process of manufacture under the designation Y1A-18. In all material aspects the models are similar. The later type is equipped with two motors of approximately 1,000 h.p. and as a result the speed has been increased to over the 300 m.p.h. mark, and so for the first time in our Air Corps' history we have an attack type with the speed of a pursuit plane.

It was stated that the Curtiss XA-14 marked the beginning of a cycle of attack plane designs and in justification of that statement it is fitting that an attempt be made here to forecast the probable development of this type.

The day of the bimotored attack plane has come and the next logical step is in a more efficient application of the power.

END

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Gliding From Pike's Peak

(*Continued from page 52*)

In my observation I found that during the summer months the prevailing wind began gently about ten o'clock in the morning, and increased in velocity during the day. At four in the afternoon it was likely to have attained at least 30 miles an hour, and sometimes more.

Using this wind to compensate my glider's loss of efficiency at 14,000 feet, I planned to soar into it along the entire length of the ridge, getting the full benefit of its buoyancy before turning out over the extensive stretch of smaller mountains. By that time I should have ample altitude to insure safe passage over them.

The topography from the top of the Peak falls steeply toward the plains for about 4,000 feet. Then it rises again sharply, forming the so-called Rampart Range, which drops down again to the prairie.

With Pike's Peak in the background a vast basin is formed in which slow, but constantly rotating wind currents are found. A canyon traversed by the famous Pike's Peak Cog-Road cuts deeply through this Rampart Range. By flying near it, I could use this canyon as an emergency pass if, by any mischance, found myself unable to clear the basin's ridge.

I had spent much time over a period of years collecting the data necessary for plottting this course, and at the end of last summer's flying season, I was ready to put my calculations to a test. However, the hot weather desirable for thermal current advantages was fast coming to an end, and I realized that were I to inaugurate my initial attempt that season, progress must begin soon.

At that time I was flying an open fuselage secondary glider. It had some nice flying characteristics, but was stressed very little better than the ordinary primary trainer. At first I had not thought of using it on the Peak hop, hoping that I might interest someone in my plans to the extent of financially backing the utility glider that I wanted. But laymen in aviation whom I approached doubted whether a glider could be launched in that altitude.

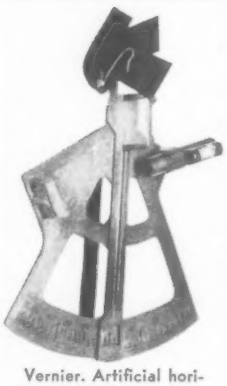
Aviation enthusiasts agreed that the venture would be an achievement in motorless flying, but considered it too hazardous to risk. So I now decided to reconstruct my secondary glider for the purpose. Although I could not expect much of it as a soarer, I felt that by extra-stressing the wings it could be made to serve for an experimental glide.

I say, "made to serve!" Trout fishing is best done with rod, reel, and selected flies, but I have yanked some speckled beauties from Colorado's streams with a willow-branch pole and a plain hook on grocer's twine. By attempting the glide, I hoped to arouse enough interest to back proper equipment for other flights.

On the steel members of the fuselage I built a tapered nacelle, smoothing out the airstream around the pilot's seat. The wing tips which were originally built square, I rounded off, insetting the aileron. This change increased the total efficiency of the airfoil and made for more sensitive aileron control.

Strengthening the overhead cabane to allow tighter rigging, I installed a drift wire between the usual two flying wires on each wing. I clamped a perfectly calibrated strut-type airspeed indicator to the starboard wing, and equipped the cockpit with an altimeter and inclinometer. Then I rejuvenated all fabric surfaces with new dope and finished my labor with a paint-job of shining aluminum.

Saturday afternoon on the twenty-second of August, 1936, with my ground crew we assembled at the airport to make test flights on the completed ship. The air was hot and still, and altogether weather conditions were superb for a



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thorough check of glider and instruments.

A 1,000 foot cable was attached between glider and tow-car, and at 26 miles an hour we left the ground and climbed slowly to about 500 feet. Giving the ship its head, I found its balance had not been disturbed by my alterations, and in a normal glide back to the runway I estimated its gliding ratio at about 15 to 1.

After a number of flights making easy turns and dives, I took off from the extreme end of the field to give the plane a real test. Holding the nose high I kited to the end of the cable and cut loose. From about 800 feet I flew into a stall, made one complete turn of a spin and held her in a dive.

At 70 m.p.h. I leveled out gently, then banked steeply for a fast flipper turn to right, then left, and dived out the rest of my altitude. With a combination sideslip and fish-tail, I floated in to a landing.

Realizing I still was not properly equipped for severe mountain flying, I was nevertheless pleased with the performance of my available material, and laid plans for an early trip to the Peak summit.

Laid out facing the prevailing wind, I had anchored a 100 foot wooden slide from which I would launch, using a shock-cord catapult. I had also brought a 60 foot cable to use in towing the glider with a car, in the event the wind was strong enough to give me flying speed with a comparatively slow ground speed.

The road across the summit is straight and well graded, making a fine runway for the launching. This method appealed to me over the catapult device, as I thought it would be slower and give me more time in which to get my bearings, once in the air. We trucked the glider to the Peak top during the night and by sunrise it was assembled and ready to fly.

It was not until nearly sunset however, that the prevailing wind reached 30 m.p.h. Then I dispatched members of the crew to stop auto traffic, while the rest of us wheeled the glider onto the road and stretched the cable. In order to take advantage of this wind in a towed launching, I had to fly between a telephone line on one side of the road and a tall building on the other.

It did not occur to me until too late that the leeway at the wing tips was dangerously small. The auto drew the cable tight, and with a man at each tip to steady the glider, I waved the signal. For a few seconds we bumped over the gravel, and then in less than fifty feet the plane took the air lightly, soaring immediately to the end of the cable.

When the car reached the end of the straight road, I dropped the cable and settled into a fast glide for the windward slope, and the buoyant air I hoped would carry me even higher than the summit of Pike's Peak.

At this point the unanticipated happened, and I never reached that slope. A cross-current struck under the starboard wing, sending the ship into a steep list. Before I could recover I had drifted from over the road and had lost enough altitude as to scarcely clear the roof of the old building now directly in my path.

Banking away from it was impossible because of the phone lines, but I saw that only my port wing was menaced by a chimney projecting above the roof. At the precise moment I kicked rudder against a slip, and at the same time boosted the wing as high as possible, hoping to rock safely past this chimney.

My guardian angel was playing chess with St. Peter that day. The wing tip caught the top course of bricks. The chimney crumbled and the glider pirouetted, crashing on the roof. Had it settled there, I would not have been injured. Instead it slid to the ground, crashing again among jutting boulders.

One of these poked through the steel seat-bottom with such force as to crush the bone of my thigh. The wings crashed down around my head, breaking my goggles and inflicting many painful wounds.

While I was not seriously injured, I must have presented a woeful sight, for I was smeared with blood, and my clothes were torn to pieces.

A short period in a hospital has completely restored my health, but winter reigns over the wreckage of my glider, abandoned where it crashed among the rocks on the summit of Pike's Peak.

In the few seconds of flying I did, after an altitude launching far surpassing that of any other glider, my faith in a successful flight is strengthened, rather than discouraged by the crash.

I see now, that it could have been avoided by more careful attention to detail. Sometime in the future I hope to acquire a utility glider, and at that time when I am ready to try again, I am sure the experience gained, rather expensively, on the first attempt will see me through to a *bon voyage*.

END

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Old Days at Hempstead

(*Continued from page 32*)

day? But they didn't want to be headline heroes, and they didn't care to go to war although some of them did. Topsy Sherwood was killed in Italy and Blair Thaw in France. They had no desire to make democracy safe or rescue Alsace Lorraine, or kill their fellow men. Not they. They hadn't even heard of such things.

They were genuinely and intensely interested in a new art and its improvement. Also, if the opportunity offered, they were not averse to picking up some easy money from exhibition flying. There were some too who didn't need to make money but there were many who lost all they had even their lives.

One of the boys decided to get married after he had cornered some cash, so he did and he took his wife to the Hotel Astor as this was a special occasion. In the middle of the night he was held up by a couple of yeggs who took all of his hard earned cash and his wife's jewelry. It took him a long while to get over that.

But to get back to Topsy Sherwood. He was a tall rawboned curly headed blonde kid from a high school in Brooklyn. He read in the papers about the Wrights and Curtiss and Bleriot and the rest, so he decided to build an airplane—and he did build an airplane. It was a Curtiss copy and he had, I believe, a Cadillac engine in it at first. Perhaps you remember the old '12 Cadillac engine with its copper water jackets.

Well, it didn't fly very well with the Cadillac because Topsy was pretty heavy and the plane was pretty heavy but Cliff Hadley loaned him a Roberts two-cycle engine which was much lighter and really packed some power. So, as soon as Topsy got it installed, he took it out but found it was tail heavy. You see Topsy wasn't exactly an aeronautical engineer.

Topsy had a solution though. He hung a 16 lb. shot on the front wheel and away he went to see New York City. He ran out of gas, however, and had to land in the Hackensack meadows. But Topsy was happy. He was having a swell time.

Clifford B. Harmon staked some of the boys. Clifford B. Harmon was wealthy and Clifford B. Harmon imported a brand new French Farman from France which he flew many times over old Long Island and Connecticut. It was from Harmon's Farman that Captain Baldwin got some ideas for his Red Devils.

Yes, and I remember the time Tex Millman washed out in the Gallaudet tractor because I helped fix it up and the time J. V. Martin flew the Aeromarine when Dennison Gallaudet said it couldn't be done, but then those were just incidents I suppose. Nevertheless they stick in my mind.

Now about Cliff Hadley. He was in business in Tarrytown, N. Y., and a profitable business it was too, but he read about flying and got the urge. He designed and built himself a beautiful large biplane with some original features such as an inverse dihedral to the upper wing to improve his lift. It had excellent workmanship for Cliff was a craftsman of a high order. In it he put a 50-horsepower Emerson engine, one of the first airplane engines built in this country.

Unfortunately, the plane proved too heavy for the Emerson and just barely got off the ground at the Empire City Race Track (where he first tried it). So he came down to Mineola and built himself a Curtiss pusher with a Roberts, another airplane engine made by old man Roberts out in Sandusky, Ohio. With this plane he made many brilliant flights.

The time he flew off the ice, he borrowed an old Red Devil from Pete McLaughlin and put his Roberts in it. You see Pete decided he wanted to have an exhibition team so he had Tod Shriver build a couple of Red Devils and away they went to the West Indies.

Oh yes, and the Gallaudets. Edison Gallaudet was a tall scholarly gentleman, but Dennison his brother was rough and tough and lame in one leg. They hailed from Norwich, Conn. Edison had been a professor of mathematics at Yale. In truth, Edison was a brilliant engineer. He went to France in 1912 and learned to fly at the Nieuport school.

Now Edison had some very advanced ideas. He decided to build himself a metal monoplane and he did. But some of his ideas didn't work any too well. He had a 100 horsepower 14-cylinder Gnome engine in the nose driving a propeller in the tail end by means of a long shaft.

Edison took off at Mineola with it but he couldn't control it because of the torque, so he cracked up and was badly injured. As soon as he recovered, however, he turned to and built several other planes with the help of his brother. One was a tandem monoplane built completely of aluminum, while another was a beautiful twin-drive monoplane flying boat powered with a Maximotor. Later on Edison designed and built many planes for the United States government.

And there was George Schmidt who had himself a new little monoplane with which he flew many an exhibition and the fellow who spent years building the huge birdwing monoplane in the north hangar on which he spent thousands of dollars but never got anywhere.

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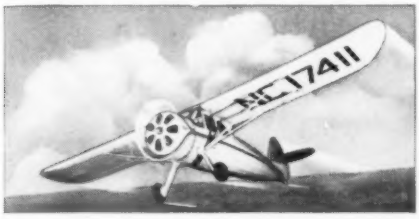

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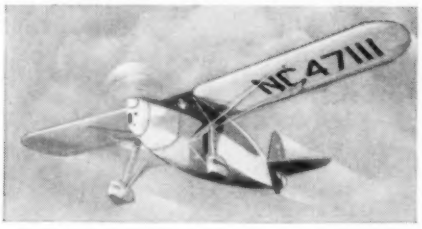

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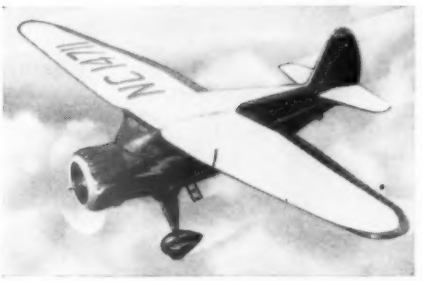

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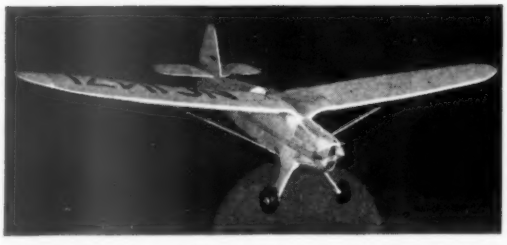

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The Four-Motored Boeings

(*Continued from page 46*)

amazing compactness was being assembled, complete even to a rolling-pin and salt cellars. The crew's cabin and control room was probably the most interesting of all. Of almost yacht-like proportions, the control bridge seats two pilots (or flight officers), a radio operator, a flight engineer, a navigator, and in addition provides ample space for bunks for off-duty members of the crew.

A passage-way leads from the control room to the bow compartment where mooring lines, anchors, etc., will be located. Leading off into the wings from the after portion of the cabin are walkways for the flight engineer and officers, enabling them to make repairs or adjustments on all engines, even when in flight. Each engine nacelle, incidentally, is large enough to accommodate two or three men and is provided with lights and a telephone.

Leaving the "mock-up" room amid a buzz of saws we next visited the various primary shops. In the first patterns, jigs, and templates were being made, while huge drills cut through heavy steel and dural fittings; pre-drilling all large parts before assembly.

In the machine shop row on row of complicated machines met our eyes. Lathes, drills, punches, metal saws, and a seemingly endless variety of specialized motor tools were humming in every direction. It was interesting to note the variety of small parts being made for Boeing ships.

With the exception of tires, wheels, instruments, and other special parts, practically all parts are made from raw materials in this factory. Even nameplates for the various instruments and levers were being made in one part of the shop, an intricate imported machine cutting letters from bakelite or sheet metal.

An ingenious Oxweld cutter was in operation on one section of the floor. This almost human machine will accurately cut heavy bar steel stock to rough shape for machining. Working on a pantograph principle, the guide follows a template and directs the cutting torch over the steel bar as it cuts through the metal as if it were paper.

Further down the line, an electric spot-welder was in operation, joining sheets of aluminum together automatically. This is used on non-stressed parts mainly.

Passing the various welding machines where engine mounts, gas tanks and other parts were being fabricated, we entered the heat-treating room. Here automatic furnaces keep a constant temperature for hours. Landing gear fittings for YB-17 bombers, 307 transports, and highly stressed fittings for the Clippers were all under "treatment" here.

In the wing shop huge dural girder spars for the Clippers were taking shape. Looking more like parts for some bridge than for an airplane, these trusses were lined on either side of the room. Alloy ribs were being riveted also, and finished ribs were hung, row on row, over our heads. In another shop tail surfaces for YB-17's and Clippers were being assembled and "skinned". Movable surfaces of all new Boeing ships are of tubing construction with fabric covering. Together with the rear portions of the wings on the Clippers and the XB-15 Bomber, this constitutes the only fabric used in Boeing ships at the present.

In the finishing department a group of masked men was hard at work painting and "priming" various Clipper parts; from ribs to huge spars. A bright yellow oxide paint is sprayed on all metal parts before the final coating of aluminum non-corrosion paint. A few spare parts for F4B-4 Navy fighters and P-26A Army pursuits were also being rushed through the paint room—replacement parts for some of the many ships of these types still in service with Uncle Sam's forces.

Our next visit was to the hammer shop and mold room. A comparatively new building, it houses the immense presses and drop hammers as well as being the headquarters for the die-making department.

In the rear of this shop a "mock-up" of the after portion of the 314 Clipper was being built-up of wood and plaster. After the final shape is determined a plaster cast is made from the "mock-up." This cast, when dry, is set in sand and into this mold molten zinc is poured to form a die. From this casting a lead punch is poured to complete the drop-hammer unit.

All formed parts, such as cowlings, doors, nacelles and any special curved parts, are formed in this manner. It is interesting to note that plaster dies, to a number of 5,000, are kept on file for ready use and about 500 die and punch sets are instantly available for hammer operations.

On our way to the hangar where the first two Clippers were being assembled we stopped a moment in the wood shop to watch progress on the 307-S stratosphere transport "mock-up". This four-engined ship is in general design much like the YB-17 bomber but is slightly larger in all dimensions, and has a large perfectly symmetrical fuselage. A pressure cabin, looking much like a huge vacuum bottle will be used to maintain pressure at high altitudes.

Four new *Cyclone* G-100 engines of 1,100 h.p. each will power this giant of the airways. More details of this interesting project, which is being developed jointly by Pan American Airways and TWA cannot be divulged at this time.

Arriving at the building wherein the Model 314 Clippers were taking shape we were amazed at the immensity of these flying boats. At first glance they looked more like yachts under construction on the ways of a well-equipped yard. Two hull jigs had already been constructed, with one ship actually having all bulkheads in place.

The center section for the first ship was being assembled in inverted position in the middle of the floor and at first glance resembled a two or three-story house. It measures just over 28 feet from keel to top!

The wing center section, which is built integrally with the hull, houses the baggage and mail compartments and also has a wide walkway to the navigation room. A small blister-like protuberance, which at first glance looked like a turret, proved to be a lookout post for the navigator when "shooting the sun" with his sextant.

While still partially overcome with wonder at the size of the Clippers we left this intriguing shop and drove the mile or so to the new assembly plant, located just across the Pacific Highway from Boeing Field—Seattle's airport. This building is said to be the most modern and most complete structure of its kind in the world, and measures 200 by 300 feet.

An overhead clearance of 35 feet is available throughout and contains no posts or floor obstructions whatsoever. Costing more than $250,000 this structure was completed in November, 1936, and at the present time is being doubled in size to accommodate the model 307 transports, soon to be assembled.

After ships have had their final ground tests at the assembly hangar, or "plant No. 2" as it is known, they are taxiied across the airport to the test hangar, where they are in turn taken aloft by Boeing or service test pilots. So large are these new four-engined ships that all hangar handling must be done on small dollies. With these in turn mounted on tracks the ships are shunted in and out of the hangar sideways.

After returning to the main factory we learned more of the interesting developments now under way by the Boeing company. One of the most interesting was the use of a perfectly symmetrical airfoil in all four-engined Boeings. This amazing wing-section, as used in YB-17 and XB-15 Army bombers, and in 307 and 314 projects now under development, gains all lift through actual incidence of the wing panel itself.

It has been found to present a very low drag and at the same time has a lift coefficient comparable to the much-used Clark Y. This section also permits of a more efficient nacelle mounting and from all points seems to be a great success.

One does not fully comprehend the potentialities of this present Boeing "four-engined era" until after having seen such a program in production. From all indications the Boeing company has started a trend that will be much copied by all countries.

Our own Air Corps now has many of the successful high speed YB-17 bombers in use and soon our airlines will have Boeing four-engined transports and flying boats in regular service.

END

NEW CURTISS F11C4 NAVY PURSUIT

28" Span. Length 20½". Weight 4 oz. 1" Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD
A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3¾" celluloid. 1000 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.
Construction Set complete, postpaid..... $4.50

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41" Span. Length 28". Weight 8 oz. 1" Scale

This new model, built very strong yet light in weight, is practically crashproof and will out-perform any large scale model built. Rises from ground in 10 feet and flies over 650 feet. Set contains all parts printed on balsa, ready cut pant cores, 4¼" turned motor front, 11" steel type carved paulownia wood propeller, 2½" balsa wheels, tail wheel, formed wire parts, 26' rubber, 3 oz. yellow dope, 2 oz. blue, ½ oz. black, 2 oz. glue, cement covering, full size scale drawing, and all parts.
Construction Set complete, postpaid..... $4.95
ELF 1/10 H.P. Gas Motor may be used on this Vega model.

NEW NORTHROP A-17 ARMY ATTACK

24" Span. Length 17". Weight 2¼ oz. ½" Scale
Color yellow and blue
A new scale model of one of the 125 Northrops ordered for the U. S. Army. Set contains all parts printed on balsa, turned motor front, 7" carved propeller, insignia, wheels, set of colored dope, glue, and all parts.
Const. set in labeled box, postpaid..... $2.50

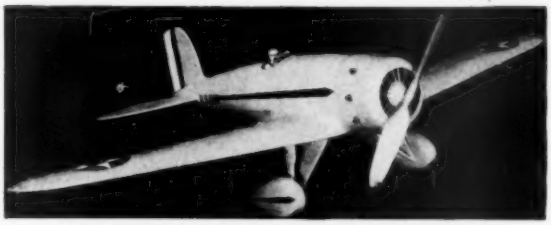
NEW LOCKHEED ELECTRA R-20-1

27½" Span. Length 19". ½" Scale. Color silver and red. This is an exact scale model of plane used by Amelia Earhart and transport lines.

Set has all parts printed on balsa, turned motor fronts, carved steel type props, set of 3 colored paints, glue, etc., balsa wheels, concealed motor unit through fuselage. Scale drawing.
Construction Set complete, postpaid..... $2.95

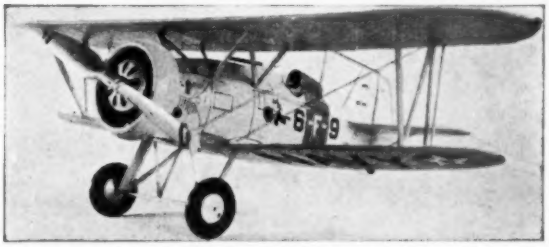
Note: In issuing money orders, use St. George, N. Y., postoffice

NEW LOCKHEED P23A NAVY FIGHTER



COMBINATION LAND AND SEA PLANE SET
32" Span. Length 20½". Weight 3½ oz. ¾" Scale
New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc., printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ½ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 feet of rubber, and large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.
Construction Set in labeled gift box, postpaid..... $2.95
Above model is latest improved type, just out.

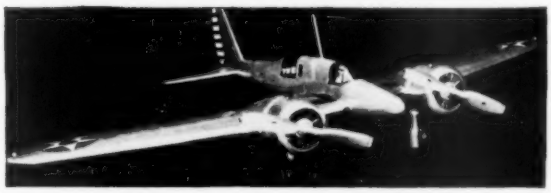
NEW BOEING F4B4 NAVY FIGHTER



22½" Span. Length 14½". Weight 2½ oz. Color, Grey, etc.

This is the finest equipped Boeing, F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished steel type propeller, printed out balsa wood parts, 2 oz. grey dope, ½ oz. yellow, ½ oz. red, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set complete, postpaid $2.95**

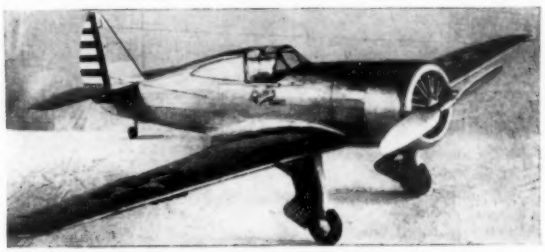
NEW CURTISS Y1A-18 ARMY ATTACK



38" Span. Length 26". Color yellow and blue

This new twin motor model has lots of reserve power on its two 8" props and flies very well. Set as all parts printed on balsa, colored paints, glue, etc., full size scale drawing, two 3" turned bal-sa motor fronts, wheels, two 8" steel type carved props, etc. **Const. set, postpaid..... $4.50**

NEW CURTISS ARMY HAWK 75 or P36



37" Span. Length 27". Weight 4 oz. 1" Scale
Latest Army pursuit. Set includes all parts printed on balsa, 10" steel type propeller, 4" motor front, 3 oz. silver dope, glue, etc. **Set, postpaid..... $3.25**

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Save Your Bravery!

(*Continued from page 20*)

be considered from all angles by those who consider chucking in their lot with either side.

Take the case of Sergeant-Majors Onoda and Agawa who were flying a captured Chinese ship over Shanghai. They hoped to make a very important reconnaissance of the Chinese positions but their ruse failed and they were shot down. Onoda and Agawa landed their ship safely, got out and set fire to the plane and then, like our Frank Luke of the World War days, had to fight it out to the bitter end with automatic pistols.

Major Shimidzu was flying a Japanese Kawasaki 88 single-seater over Harbin in 1932. He attacked a troop of Chinese cavalry but caught a bad burst of 20 machine gun bullets in his engine and had to land. A troop of Chinese cavalry attacked him while he was climbing out of his disabled ship and he drew his pistol and killed several before they could overpower him and finish him off with a lance through his throat.

During the same engagement Lieut. Ishitani and Sub-Lieutenant Koyoda staged a trench-strafe on Chinese troops while flying a Kawasaki two-seater. All went well until a chance bullet fired their tank and they had to side-slip down to a quick landing. They stood by their ship until it was completely destroyed by flames and then staged a heroic battle for their lives and both died fighting desperately.

There's no half-measures in this Chino-Nippon affair.

A few days after this, Sub-Lieutenant Itoh and Sergeant-Major Inukai, while attacking ground troops in a two-seater, suffered the same fate and wound up fighting to the last against a swarming tribe of Chinese plainsmen who were out to revenge their dead.

On one occasion, an American Fokker monoplane carrying six Japanese, including four gunners, was shot down by a swarm of Chinese single-seater pilots who were in the air at the same time. The Fokker crowd fought gamely but eventually folded up after a torrent of lead had been poured into the great cantilever wing. All six died a horrible death and thus, with the old spirit of *Samurai*, these Japanese airmen went to their deaths and displayed the true tradition of *Bushido* to the admiration of the whole Japanese nation. But the Chinese troops cut their hearts out just the same.

But perhaps you like this sort of thing. If so, the Chinese-Japanese war is just the place for you. Heaven knows that, if you're of the bloodthirsty type, you'll find ever so much good live material (providing they don't find you first) over there.

Hundreds of such incidents could be related, none of which adds much to the accepted glamor and code of modern warfare. If the Chinese do these things to the Japanese, what do the Japanese do when the situation is reversed?

There is only one answer.

Those of you who are considering Shanghai as an outlet for your pent-up emotions and future, should first think of all this. No matter which side you may join up with you must first of all remember that you are fighting an Oriental enemy, which is entirely different from anything we faced on the Western Front. On the other hand, you might wait a few years; you might find out that you can still become a war-air hero without flying far from the Pacific coast.

END

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Gulfhawk

Pylon Polishers

(*Continued from page 42*)

since the start was a typical race-horse departure from the post. By the time the first pylon was reached he was in seventh place and at the end of the first lap he took sixth which he held until lap five.

Midway in this turn around the course he moved into fifth place and held this until lap 15.

Here he moved up to fourth place, opening up his throttle until the engine was delivering about 2,000 r.p.m. His average speed up to that point had been about 240 m.p.h. The leader at that point was Steve Wittman with his "back-yard" racer (Curtiss D-12 engine) whose average speed had been about 22 m.p.h. faster and whose fastest single lap had been made at 267 m.p.h.

Two laps later—on the 17th—Wittman pulled up off the ground with a badly overheated engine due to loss of oil from a leaking pipe. Roscoe Turner, Earl Ortman and Kling flipped past him.

They held their positions through the 18th and 19th laps and Turner, who was well ahead with average speeds of 262 m.p.h. to that point, apparently a sure winner.

Going into the 20th lap Kling still was in third place. From the ground he got the signal that the time had arrived to give his engine all the coal it could absorb, and he jammed the throttle wide open.

He began creeping up on Ortman but Turner was still four miles ahead. But on pylon No. 2, with but five miles to go, Turner pulled up and made a 360 turn around the pylon in the belief he had gone past it inside and in violation of race rules.

This left Ortman and Kling, moving ever closer together, in first and second places respectively. Rudy was nursing his mount to get everything in it but Ortman stayed ahead even round the fourth pylon.

Desperately Kling dove to get another mile on his speed and in what was the most sensational finish in the history of the Thompson race he caught and passed Ortman 400 yards from the judge's stand. His average speed was 252.9 m.p.h. while Ortman's was one-tenth of a mile less. Kling's elapsed time was 57/100 of one minute less!

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The Admirals' Patrol Boats

(*Continued from page 30*)

to land on the water due to engine trouble. The plane was located by the destroyer *U.S.S. William Jones* on the morning of Sept. 1 and, with all hands safe on board, was towed back to San Francisco. The PN-9 No. 1 had, in the meantime, continued westward sending in her reports by radio to the ships stationed along the route. All went well during the night with messages indicating that the gas supply was running low and that a landing would probably be made near the *U.S.S. Aroostook*, stationed about 200 miles from Honolulu. The last message from the plane at 4:09 a.m., Sept. 1, merely asked "What is weather?" The *Aroostook* at 4:20 a.m., asked the plane for its course but received no reply. Then started an intensive search, by all Navy craft available in that area, which lasted for nine days. Hope had been almost abandoned when the plane was found by the submarine R-4, 15 miles from Nawiliwili with all personnel safe, entirely out of fuel, and slowly proceeding, with the aid of an improvised sail, toward its destination. This was the first flight of an airplane across the Pacific and although the flight was ended a comparatively few miles from the goal set, it had demonstrated the fact that it could be done and in addition showed clearly the seaworthiness of the flying boat which had quartered six men for nine days in the open seas.

In order to encourage development work in this type of plane the Navy, following the flight of the PN-9's, turned over the results of their experiments and developments to the aircraft manufacturers and ordered patrol planes to meet Navy specifications. However, several years elapsed before commercial manufacturers were experienced enough in the building of flying boats actually to turn out a product marking advancement. An exception was the Boeing company which had built the PB-1 type to take part in the San Francisco-Hawaii flight but which had not been completed in time.

During the past five or six years outstanding contributions by various aircraft manufacturers have been made to the development work which was carried on so zealously by the Navy. This is attested by the successful accomplishments of the commercial services to South America; from the west coast of the United States to the Philippines, and record breaking formation flights by patrol planes of the Navy.

What marvelous strides have been made in aviation since the days of the first trans-Atlantic flight in 1919! From the wood to steel construction of the airplanes; from the war-produced Liberty engines and their frequent failures to the dependable engines of today; from the 63 knots to average speeds of well over a hundred knots; from an ordinary magnetic compass and a bubble in a tube of liquid, to instruments of uncanny accuracy showing direction and plane attitude; from dead reckoning and flying by visual land or sea marks to radio beams . . . With the earth's surface entirely obliterated by fog or darkness the ships of the air now speed forward on schedules prepared before take-off. There's no more of this "pioneering" death-defying flying "by the seat of your pants." The modern airman knows exactly what lies before him.

With this remarkable record of accomplishments behind us we are prone at times to overlook the efforts and the vision which have made it possible. Perhaps this is due to the fact that the pioneers and their progeny are not resting on their laurels—they are still untiringly at work on what to them is unfinished business, firm in their belief that the best airplane has yet to be produced.

END

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1/16", 3/16", ¼" ....10c ft.

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All col.. doz. 19c
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½	.01	.03
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1⅜	.04	.08 .10
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½x ¾x 6 6—5c
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DOPE Clear
1 oz. 5c ½ pt. 25c
2 oz. 10c

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1 oz. 5c ½ pt. 30c
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BAMBOO 11 in.
1/16x¼...6 for 5c
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ALUM. LEAF
2 Sheets 1c

WIRE
6 ft. 3c

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Best, 1 oz....5c

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1/32, 1/16" 3 ft. 1c
¼ in. ...3 ft. 2c

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10c. Add 5c per in. up to 10 in.

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5 in. 4c
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Bechereau and His Spads

(*Continued from page 36*)

speed of 116 m.p.h. obtained at sea level and a ceiling of 20,800 feet cannot be called poor performance for its time. This performance was achieved with a military load of 825 lbs.

But as soon as ground engineers began to decorate the S-11 with flare cases, bomb racks and other paraphernalia promiscuously tacked here and there over its anatomy, trouble announced itself in no uncertain terms.

The speed dropped, landing speed increased, the ship became unbalanced longitudinally, tight turns often ended in spins and a low climbing angle was necessary to prevent a stall.

Nevertheless, France and her allies continued to force improperly loaded S-11s into the air, pilots cursed its poor characteristics and observers complained of poor working conditions.

While the S-11 was still in its test period young Bechereau returned to his drawing board, figured and sketched on his scratch pad and went into conference with Bleriot and Birkight.

Three more conferences followed, and early in February, 1917, work was started on the Spad 12Ca-1, a type which promised to be as deadly an air weapon as could be conceived, but which was discarded only to be revived in England in 1915.

In appearance, the S-12 was but a slightly enlarged S-7 plus a few improvements. The wing area was increased to 215 sq. ft., rudder area enlarged by rounding out its trailing edge, and a special Hispano-Suiza motor type 8Bc of 220 h.p. was used as power plant. Wing construction, strutting and rigging arrangement was as previously employed in the S-7.

Armament was the outstanding factor in the S-12. In addition to twin Vickers synchronized guns, this machine mounted a cannon of 37 mm. bore, which fired a one-pound shell through a hollow propeller shaft. This arrangement was made possible through use of a geared engine.

The cannon was fitted low between the outspread cylinder banks just high enough so its barrel could be extended through the reduction gear which drove the propeller.

As a pursuit type, the S-12 was perhaps the fastest machine of its time, and was definitely superior in every respect to anything Germany had to offer, except perhaps the Fokker Dr.I, which had the edge on it for maneuverability.

Service tests at the Front, however, somewhat discouraged the S-12. Guynemer flew the S-12 for several weeks noting with special attention the practicability of cannon equipment. Although he actually brought down one German machine with this cannon, he advised against its general use for two reasons:

First, about 30 seconds were consumed in reloading a shell during which time the pilot was so occupied with his gun that he became a good target for the enemy. Second, continual firing of the cannon created shocks which soon loosened up the motor and at the same time filled the cockpit full of powder fumes which tended to nauseate the pilot.

Rene Fonck presented the same objections after testing the S-12 under service conditions. Both Fonck and Guynemer agreed, however, that if the cannon were removed, and the machine thus lightened, the S-12 would prove an ideal combat machine.

With these recommendations in mind, Bechereau returned to his drawing board and shortly produced what may be considered the finest pursuit machine of the War, the Spad S-13.

Outwardly, the S-13 resembled the S-12 in every detail, but with the cannon removed, performance was improved in every respect. Two models of the S-13 type were built, first fitted with a Hispano-Suiza 8Ba 200 h.p. motor which was sent to the Front in August, 1917.

Top speed of this model was 134.4 m.p.h. at sea level, the climb to 6,500 feet took 5 min. 17 sec., ceiling was 22,300 feet and landing speed 59 m.p.h. Armament consisted of two synchronized Vickers machine guns operated by the Vickers-Spad gun gear. Although very compact, this synchronizing mechanism gave considerable trouble because, in order to repair jams or breakage, it was necessary to tear down the engine.

One month later, France let contracts for a second model Spad S-13, which machines were identical in every respect to the first models except for the engine. In this case it was the Hispano-Suiza 8BEc of 235 h.p.

This machine was probably the fastest allotted to Western Front squadrons. At sea level top speed was 138.5 m.p.h., climb to 6,500 feet consumed only 4 min. 40 sec., ceiling was 22,350 feet, and landing speed 59 m.p.h.

As a combat machine, records of Spad S-13 results as used by England,

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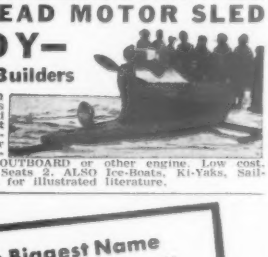

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France, Italy and the United States, under service conditions, speak for themselves. Unlike its forefather, the S-7, Spad 13 was reasonably stable because of its rigging.

Its glide was at least average, and while it maneuvered easily with light pressure on the controls, the S-13 could be made to maneuver within unusually small areas by more vigorous stick and rudder bar action. This feature of course made combat over prolonged periods somewhat more tiring than in other types, but provided a more graded degree of maneuverability than usually available in other machines.

Strength, as in the S-7, was one of S-13's most valuable features, which combined with its other fine characteristics made it a machine of no mean ability.

Disadvantages found in the Spad 13 were relative to certain features of design which made flying it uncomfortable at times. For example, in warm weather, the roomy cockpit became almost unbearably hot. In high altitude flights, the cold failed to reach the pilot but on descending the effect was that of a steam bath and tended to fatigue the flyer.

The second complaint heard in the Spad camps was that at 10,000 feet altitude and upwards, the geared engine created a most annoying noise due to the propeller slipping in the rarified atmosphere. Such faults found in this machine, trivial as they might seem, nevertheless brought a pilot-reaction that was not always favorable.

But S-13's bad points were greatly overshadowed by its advantages, and there wasn't a German flyer at the Front who failed to use extreme caution when he saw a flight of Spads roaring up to him at 130 miles per hour.

Bechereau's last pursuit ship was good enough that it wrote a finis to his career in that field during hostilities. His next design was created by a demand for a model of his S-11 which, with all the extras, made S-11 a bad boy of the air. Consequently, Spad S-16 came to being early in 1918, as an average good ship which could be depended on to do its work well.

Spad S-16 was not intended to be a fighter, but a slow, plugging observation machine that could, if called for, help protect itself from German attackers. In outward appearance she was the same as the S-11 The most important change was made in the motor which in S-16 was the new Lorraine-Deitrich 8Fb delivering 236 h.p. at sea level. Second model of the S-16 was produced late in June, 1918, intended for two-seater fighter work as well as reconnaissance duties. This machine, fitted with a Lorraine-Deitrich 8Bb of 250 h.p., found little favor because its flying characteristics were very much the same as the S-11. However, a comparison in the two S-16 models is interesting. Respective top speeds, as described above, were 116.5 and 121.5 m.p.h., climbs to 6,500 feet were 9 min. 8 sec. and 7 min. even, ceilings 15,400 feet and 21,700 feet, landing speeds 57 m.p.h. and 58 m.p.h.

When the 16A2 was still in construction, Bechereau had completed designs of a radically new type pursuit machine powered by a 300 h.p. Hispano-Suiza motor.

Known as the S.A.B. 1C-1, this new ship boasted an annular radiator, one which was made like a ring and encircled the nose of the ship just behind the propeller Its top speed was 147 miles per hour, and initial climb 2,100 f.p.m.

Just as the S.A.B., (initials of Societe Anonyme Berchereau) was to be put in production under Bechereau's own company financed by Levasseur, newsboys shouted "Finis de la Guerre!" The French army air service, stocked with hundreds of other types, failed to order these new ships from Bechereau.

What happened to Bechereau after the war is a sad tale of unsuccessful corporation finance brought on by a stagnation of the industry as far as the small man was concerned. Bechereau was rumored associated with the Buhl Aircraft company here several years ago in an engineering capacity, but that company is now defunct.

Bechereau's Spads will, however, continue to live in story, in picture, and in the minds of those who dream back to war days in the air, for is it not the Spad that carries our fictional hero to fame and glory against all odds?

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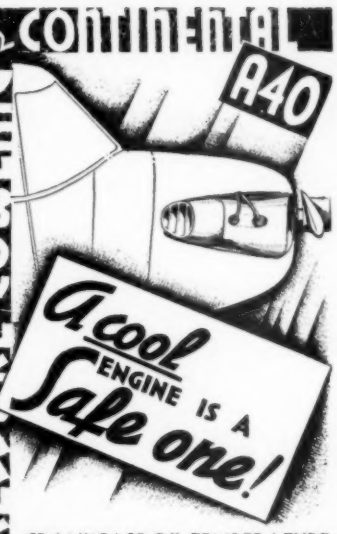

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Airy Chat

(*Continued from page* 8)

offer, hence we recommend that you avail yourself of the opportunity at the earliest possible moment.

* * *

R. R. MILLSAP, 1805 West 10th Street, Dallas, Texas, files his application for our "Quick Solo Club". His dual flying time to the solo was one hour, 40 minutes, made on a Spartan plane. J. O. Casparis was his instructor to whom we also tender our felicitations.

* * *

JOHN ERKER, Chicago, Ill., won the John B. Rathbun Silver Trophy for the best and most complete crackup of a gas model plane. This prize, in the nature of a consolation prize, was won by Mr. Erker at the Midwestern States Gas Model Contest, sponsored by the Gas Model Aeronaut Club, Chicago.

* * *

THOSE of you who have cherished a desire to fight in Spain, China or other countries, had best read a mighty fine and informative article in this issue that tells you of all the hazards awaiting the members of foreign legions. If you will wait, the chances are strongly in favor of you working off your military zeal right in this country. You never can tell.

* * *

METAL airplane construction is becoming more and more of a bridge building job with jigs, templets and all sorts of erection fixtures. We show several fine photos of airplane factory interiors in this issue that will interest our engineering students.

* * *

NO matter what else they may say about aviation or its developments, it has certainly made marked improvements in meteorology and weather forecasting. Even five years ago, weather forecasts were rule-of-the-thumb predictions—not a whole lot better than a guess, but now weather conditions over a considerable area are determined with accuracy.

* * *

STILL pursuing the subject of steam propulsion for airplanes, we believe that the steam turbine is even more desirable than the reciprocating steam engine in many respects. For example, the steam turbine is mechanically the simplest form of heat engine and has the fewest working parts. Second, it is far more compact than the reciprocating engine and delivers a uniform torque or turning moment. Third, the degree of superheat and steam temperature is far above the capabilities of the engine which means higher thermal efficiency and reduced steam consumption.

* * *

WELL, here we are at the end of the column, as usual, and with best wishes, will leave until next month, where we'll meet in the same old place.

J. B. R.

An Aerial Jaunt to Bermuda

(*Continued from page 20*)

all—because we saw it once, for beneath us—a perfect circle, with the shadow of our plane in the center—a truly amazing sight.

From time to time, the ship's navigator would open the port hole and throw out a shining bulb filled with aluminum powder. When it struck the water it burst and the powder trailed brightly through the waves, thus giving the navigator our wind drift, which he carefully recorded on his instruments.

From time to time, too, we were asked to remain quiet while the navigator took the sun's bearings—in true nautical style, with a sextant.

The door to the crew's compartment was kept open at all times, and we could see the men bending over the charts in a room very much like the chart room on lighter-than-air ships.

Dinner was served presently with fine linen and china, and several courses, and chicken as the piece-de-resistance. The Captain came in and ate at a "Captain's Table" as on shipboard. There were even finger bowls.

In the afternoon, the steward tucked a blanket around me and I slept until the coral reefs of Bermuda came in sight, pale green and apple green and dark green and pink, beneath an incredibly blue water.

And there was a tiny red sailboat to add the finishing touch to the picture as we swung low over the bay, where native boys, bare to the waist, were waiting to tie us up to the floating buoy.

Then it was that a home-like touch came into the picture, when I saw that the auto tire which floated there, supporting the mooring buoy, was a tire built in our own Akron factories. And a bit later someone informed me that these tires are also used on all the Bermuda ferries for bumpers.

A trim speed boat took us off the plane, and another boat carried our baggage ashore. We shot up to Hamilton wharf where carriages waited, each with its dark-skinned driver and faithful horses.

And as we clip-clopped up the hill, passing vehicles on the left always in true English style, instead of right, I caught my first glimpse of a banana tree and of the famed scarlet hibiscus—

But nary a Bermuda onion did I see.

Six days later I returned on the British clipper ship to New York—aptly named *Cavalier*, from the old Englanders who came to the new world—some heading for Virginia and others settling on this very isle of Bermuda.

And I found many a novelty on this ship, larger even than the American clipper—two decks if you please and even a promenade deck—with a separate smoking room, and wing-backed overstuffed chairs, whose backs and seats form life belts, in case of emergency. They are adjustable chairs, too, so that suddenly they become couches, with a mere touch of the hand, and, lo, you are stretched out comfortably for an afternoon siesta.

The crew's quarters on this ship are all "top side" on the upper deck so that you do not see them at their work of navigating as on the American ship.

Here, too, I found a cheery English captain—a man who has never ceased flying since he piloted single-seater fighters in the World War—a man whose very bearing spelled confidence.

Once on this trip we passed briefly through a storm, and rain beat on the windows but so fast were we going that the storm was left far behind, before we'd scarcely felt it.

And again—in five hours, after take-off, we saw Jones Beach, N. Y., and the narrow golden strip of Long Island sand—in a brief few minutes we were through the customs and loaded into our bus for downtown New York.

From the semi-tropics—from palm trees and banana trees to the Chrysler building in five hours.

It is true that a week-end of today is the equivalent of five week-ends in years past, all made possible by the magic of air-travel. In time to come, when planes approach the 500 mile speed promised in the stratosphere, bask in African jungles and still have our office in New York.

And there was an enthusiastic Bermudan aboard, who immediately signed up for the first trans-oceanic "passenger-carrying" clipper flight.

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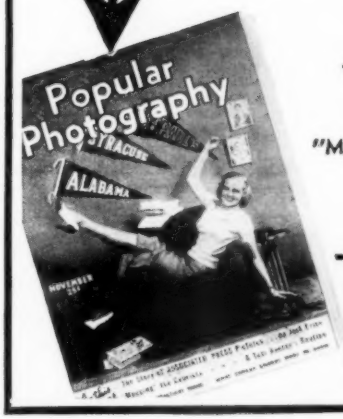

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